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Section 313 of the Clean Air Act requires the Administrator of EPA to report yearly on measures taken toward implementing the purpose and intent of theAct. This report covers the period January 1 to December 31, 1977, and descibes the issues involved in the prevention and control of air pollution and the major elements of progress toward that goal that have been made since the last report. In addition, this report also includes two other EPA reports to Congress required under the Clean Air Act as amended:

1. Section 202 report on measures taken in relation to motor vehicle emission control (Chapter VII); and
2. Section 306(e) report on Federal procurement and violating facilities (in Chapter IX).

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CONTENTS

Page

LIST OF TABLES iii
LIST OF FIGURES iv
PREFACE v
I. INTRODUCTION AND SUMMARY 1
II. AIR QUALITY TRENDS 7
  Air Quality Trends 7
  Air Monitoring Strategy 11
III. DEVELOPMENT OF AIR QUALITY CRITERIA AND STANDARDS 13
  Introduction 13
  Health Effects Research 13
  Terrestrial Ecology Effects of Air Pollution 19
IV. STATUS OF STATE IMPLEMENTATION PLANS (SIPs) 23
  Designation of Non-Attainment Areas 23
  Review of New and Modified Sources 24
  National Ambient Air Quality Standard for Lead 25
  Transportation Control Measures 25
  Inspection/Maintenance 27
  Indirect Source Review 28
  Emergency Episode Reporting 29
  Permit Fee Regulations 29
V. INTERGOVERNMENTAL RELATIONS 30
  Federal Support of State and Local Programs 30
  Interagency Cooperation 37
  International Collaboration in Control 39
VI. CONTROL OF STATIONARY SOURCES 42
  New Source Performance Standards 42
  National Emission Standards for Hazardous Air Pollutants (NESHAP) 52
  Development of New and Improved Air Pollution Control Techniques for Stationary Sources 52
VII. CONTROL OF MOBILE SOURCE EMISSIONS 59
  Introduction 59
  Measures Taken to Implement Mandated Title II Emission Standards 59
  Motor Vehicle Emission Regulations-Actions Taken in 1977 . 65
  Emissions from Vehicles in Use 68
  Assessment of Mobile Source Technology 70

CONTENTS (continued)

Page

VIII. RESEARCH IN MONITORING INSTRUMENTATION AND QUALITY ASSURANCE 75
- Monitoring Developments 75
- Quality Assurance 77
- Federal Reference and Equivalent Methods 78

IX. ENFORCEMENT 81
- Stationary Source Enforcement 81
- Mobile Source Enforcement 94
- The List of Violating Facilities 102
- Compliance by Federal Facilities 102

X. LITIGATION IN 1977 104
- Prevention of Significant Deterioration 104
- Timeliness of Challenges to EPA Regulations 104
- Hazardous Air Pollutants 105
- Transportation Control Measures 105
- Pre-Enforcement Review 106
- Tall Stacks and Supplementary Control Systems 106
- Use of Modeling in the Promulgation of SIPs 107
- References 108

LIST OF TABLES

Table		Page
II-1.	Oxidant/Ozone Trends in the 90th Percentile of the Annual Hourly Observations 1970-1976	10
V-1.	Types of State and Local Organizations Receiving Federal Funds	31
V-2.	State and Local Control Agencies Estimated 1975, 1976, and 1977 Expenditures	32
V-3.	Estimated Man-Years of Effort Employed by State and Local Air Pollution Control Agencies	34
V-4.	Estimated Distribution of Resources Devoted to Air Pollution Control Activities of National Priority by State and Local Agencies in FYs 75-77	35
V-5.	Attendance at Short-Term Technical Training Courses and Workshops	36
VI-1.	New Source Performance Standards	43
VI-2.	Status of Section 111 Regulations	44
VI-3.	Control Techniques Guidelines for Volatile Organic Compounds Issued in 1977 and Scheduled to be Issued	50
VII-1.	Emission Standards for Motor Vehicle Classes (Light Duty Passenger and Trucks)	60
VII-2.	Emission Standards for Motor Vehicle Classes (Heavy Duty Trucks and Motorcycles)	61
VII-3.	Mean Emission (G/MI) and Percentage of Vehicles Failing to Meet Standards, by Test Point and Pollutant	69
VIII-1.	Stationary Source Measurement Methods	76
VIII-2.	Ambient Air Quality Measurement Methods	78
VIII-3.	List of Reference and Equivalent Methods Established or Revised in FY 1977	79
IX-1.	Compliance Status of Major Emitters (by EPA Region).	83
IX-2.	Delegation of NESHAP and NSPS Authority to State and Local Governments	92

LIST OF FIGURES

Figure | Page

IX-1. Enforcement Actions Initiated by EPA Regional Offices . 84

IX-2. Enforcement Actions Initiated by States 85

IX-3. Inspections Conducted by EPA Regional Offices 86

IX-4. State Conducted Inspections 87

PREFACE

The Clean Air Act, as amended, authorizes a national program of air pollution research, regulation, and enforcement activities. This program is directed at the Federal level by the U.S. Environmental Protection Agency (EPA). However, primary responsibility for the prevention and control of air pollution at its source continues to rest with state and local governments. EPA's role is to conduct research and development programs, set national goals (via standards and regulations), provide technical and financial assistance to the states, and, where necessary, supplement state implementation programs.

Section 313 of the Clean Air Act requires the Administrator to report yearly on measures taken toward implementing the purpose and intent of the Act. This report covers the period January 1 to December 31, 1977, and describes the issues involved in the prevention and control of air pollution and the major elements of progress toward that goal that have been made since the last report. In addition, this report also includes two other EPA reports to Congress required under the Clean Air Act, as amended:

1. Section 202 report on measures taken in relation to motor vehicle emission control (Chapter VII); and
2. Section 306(e) report on Federal procurement and violating facilities (in Chapter IX).

I. INTRODUCTION AND SUMMARY

AIR QUALITY TRENDS

In many areas of the country the general downward trend in total suspended particulate (TSP) levels in the early 1970s was followed by an upturn in 1976. In many cases these increases can be attributed to meteorological conditions.

National trends for sulfur dioxide (SO_2) are stable now, compared to the downward trend of the early 1970s; violations of the SO_2 standard are generally confined to the areas around a few specific sources.

The nationwide data base for monitoring carbon monoxide (CO) continued to expand in 1976. Over half of the 1975 sites showed improvement in 1976.

Photochemical oxidants (O_x) are one of the most serious air pollution problems in the country. California monitoring sites are nearly equally distributed between increased oxidant levels, reduced oxidant levels, and no change; sites in other states have a slightly greater tendency towards increasing levels.

Except for the California sites, nitrogen dioxide (NO_2) monitoring sites showed almost twice as many sites with up than down patterns (145 to 77). These sites, however, had only three years of data so long-range trends cannot be shown. Of the 42 California sites, 19 showed decreases and 19 showed increases in NO_2 concentrations.

The Standing Air Monitoring Work Group (SAMWG) continued its evaluation of ambient air monitoring requirements. The major recommendations included:

1. a network of State and Local Air Monitoring Stations (SLAMS) determined by state and local air pollution control agencies to meet their needs.
2. a small core of National Air Quality Trend Stations (NAQTS) to meet national needs for air quality trend and SIP evaluations.

3. a plan for Special Purpose Monitoring (SPM) to augment data from NAQTS and SLAMS.

DEVELOPMENT OF AIR QUALITY CRITERIA AND STANDARDS

Air quality criteria documents were issued for particulate matter, sulfur oxides, hydrocarbons, photochemical oxidants, carbon monoxide, and nitrogen oxides from 1969 to 1971; primary and secondary standards for these pollutants were established on April 30, 1971. In December, 1977, EPA proposed a national ambient air quality standard for lead.

EPA has continued to support research which provides a current basis of reevaluation of the present criteria and ambient air quality standards. The health effects research program includes studies in four areas: criteria pollutants, non-criteria pollutants, transportation-related pollutants, and non-pesticide organic and inorganic substances found in the air.

Research on ecological effects have focused on the effects of SO_2 on crop yields; the effects of acid rain; the synergistic effects of sulfur dioxide and ozone; and photochemical oxidants.

In September, 1977, EPA published the first draft of the updated Air Quality Criteria for Photochemical Oxidants and Oxidant Precursors.

STATUS OF STATE IMPLEMENTATION PLANS (SIPs)

The Clean Air Act Amendments of 1977 require the states to designate the attainment status of areas within their boundaries by December 5, 1977. EPA must evaluate these designations and publish a list of area designations by February 3, 1978.

A SIP revision must be submitted for nonattainment areas by January 1, 1979, and it must show attainment by December 31, 1982. An extension until December 31, 1987, is possible for photochemical oxidants and carbon monoxide.

The 1977 Clean Air Act Amendments reinforce the December 21, 1976, Interpretative Ruling on new source review. This ruling allows major sources to locate or modify existing operations in non-attainment areas but only after restrictive emission controls have been applied and more than equivalent offsetting emission reductions from existing sources have been made.

INTERGOVERNMENTAL RELATIONS

In 1977, 55 state and territorial agencies and 230 local agencies expended approximately $174 million and over 7000 man-years to carry out the major portions of the regulatory and enforcement aspects of the national air pollution control effort. EPA provided financial assistance to 54 state agencies and 116 local agencies.

The Clean Air Act Amendments of 1977 require greater interagency coordination, both between state, local, and Federal officials and between EPA and other Federal agencies. In particular, close coordination is called for between EPA and the Departments of Housing and Urban Development (HUD) and Transportation (DOT). Federal land managers are also heavily involved in the prevention of significant deterioration.

EPA continued its international environmental involvement in 1977. EPA participated in international organizations such as the Economic Commission for Europe, the Organization for Economic Cooperation and Development, the World Health Organization, and NATO on topics including long-range transport, flue gas desulfurization and chlorofluorocarbon emissions. EPA has also entered into bilateral air pollution projects with Canada, Mexico, Japan, Germany, USSR, Egypt, Poland, and Yugoslavia.

CONTROL OF STATIONARY SOURCES

Through 1977, 83 new source performance standards have been published for 22 source categories and 63 affected facilities.

A great deal of emphasis in 1977 was given to the preparation of guidance materials which reflect reasonable available control technology (RACT) for volatile organic chemicals.

Amendments to both the vinyl chloride and asbestos NESHAPS were prepared in 1977 and benzene was listed as a hazardous pollutant.

Research efforts for improved air pollution control techniques have emphasized flue gas desulfurization, both regenerable and nonregenerable systems; other systems to reduce SO_x emissions, including the fluidized bed combustion process; combustion modification for control of NO_x emissions; and fine particulate control.

CONTROL OF MOBILE SOURCE EMISSIONS

The major element of the program for the control of motor vehicle emissions is EPA's Federal Motor Vehicle Control Program (FMVCP). During 1977 EPA tested for certification the 1978 model year vehicles. This required testing vehicles from 50 manufacturers and involved conducting 2200 emission tests. EPA also tested approximately 900 vehicles to determine their fuel economy rates.

EPA promulgated regulations prescribing more stringent gaseous emission standards for heavy-duty gasoline and diesel-powered vehicles for the 1979 and later model years. Standards for motorcycle emissions of hydrocarbons and carbon monoxide were published in January, 1977.

The Restorative Maintenance Evaluation Project, designed to determine why many in-use automobiles do not meet emission standards, was completed in 1977. The project indicated that idle mixture maladjustments are largely responsible for failure to meet the hydrocarbon and carbon monoxide standards, and that improved emission performance does not harm fuel economy.

Three-way catalyst systems have begun appearing on certified vehicles in growing quantities and appear to be the systems considered most seriously for future applications. All-electronic control systems for future automobiles is another area of accelerated research.

RESEARCH IN MONITORING INSTRUMENTATION AND QUALITY ASSURANCE

Reference methods pertaining to new source performance standards were revised on August 18, 1977. Methods and instrumentation were developed to measure emissions of polychlorinated biphenyls (PCBs), hydrogen sulfides, fluorides, as well as other pollutants. For mobile sources, a reference procedure capable of measuring individual hydrocarbons in diesel-powered vehicle emissions was developed, as well as improvement of procedures for measuring hydrogen cyanide. Ambient measuring methods were developed in 1977 for lead, PCBs, ozone, and asbestos.

A five-year quality assurance plan was published in July, 1977.

A new Federal reference method for NO_2 was promulgated on December 1, 1976. A short-term continuous NO_2 standard measurement method was also developed.

ENFORCEMENT

Stationary Source Enforcement

Enforcement of standards at stationary sources has focused on the 23,000 major emitters which account for about 85 percent of all air pollution from stationary sources. As of October, 1977, over 20,000 were operating in final compliance and nearly 1,300 more were on enforceable compliance schedules or orders, representing a compliance level of 94 percent.

From October 1, 1976, to September 30, 1977, EPA conducted over 2,300 plant inspections and 662 formal enforcement actions; the states were responsible for 26,000 field inspections and the initiation of over 15,600 enforcement actions.

Despite this enforcement activity, more than 1,200 major sources remain in violation of emission standards or compliance schedules.

Mobile Source Enforcement

EPA conducted 85 inspections and investigations of auto manufacturers and 71 investigations of tampering with vehicle emission control systems which resulted in 34 prosecution referrals. As a result of EPA investigations, manufacturers have initiated recalls of 5.6 million vehicles. There were 40 investigations of alleged illegal importations.

In FY 1977, there were 29,847 service station inspections for lead content in fuels. As a result, 747 complaints were filed and $226,865 in civil penalties were assessed.

The List of Violating Facilities

Consent agreements were reached with three facilities in 1977 after the process of designating them as violating facilities ineligible for Federal contracts was begun. These facilities were Kaiser Steel Corporation, Fontana, California; U.S. Steel South Works, Chicago; and Interlake Steel, Chicago.

Compliance by Federal Facilities

As of November 1, 1977, 68 (17 percent) of the 393 major Federal facilities were out of compliance with emission limitations. Forty-five of these non-complying facilities are on approved compliance schedules.

LITIGATION IN 1977

Decisions are pending on the use of dispersion techniques as opposed to constant controls systems, on the legality of EPA regulations requiring states to implement measures to reduce air pollution from private vehicles using public roads and on the use of air quality dispersion modeling as a basis for regulation.

Among the important court decisions in 1977 was a decision by the U.S. Court of Appeals for the Second Circuit that a state and its subdivisions can be required to implement transportation control measures in a SIP, at least when the measures had been adopted by the state itself.

II. AIR QUALITY TRENDS

AIR QUALITY TRENDS

Total Suspended Particulate (TSP)

During the 1970s there has been nationwide improvement in TSP concentrations. Many areas continued to improve in 1976. Of the TSP trend sites with complete 1975 and 1976 data, 54 percent of the sites that were above the primary TSP standard in 1975 continued to show improvement in 1976.

The general pattern for 1970-1976 shows stability for the lower concentration sites and more pronounced improvement for the higher concentration sites. During this time period the overall rate of improvement was slightly less than four percent per year with more marked improvement in the Northeast and Great Lake regions.

There was fairly consistent improvement from 1970 to 1976 with 72 percent of the sites having decreases in ambient TSP levels. Because air pollution control strategies are designed to reduce levels at locations exceeding the National Ambient Air Quality Standards, more pronounced improvement would be expected for the sites with higher concentrations. For those sites with 1970-1973 averages above the annual primary standard, 81 percent showed improvement.

Although all areas had improved TSP levels in the 1970-76 time period, trends in the western areas of the country were generally less pronounced. In many cases this geographical variation is attributable to a difference in the nature of TSP problems. Windblown dust is an important component of TSP levels in the West and is more difficult to control than emissions from traditional sources.

The general downward trend in TSP levels in the early 1970s was followed by a reversal in 1976 in many areas of the country. Based upon changes between comparable quarters in 1975 and 1976 for these TSP trend sites, 53 percent of these comparisons showed increases. Over half the states had more increases than decreases between 1975 and 1976. There were distinct geographical differences--the Southeast, Midwest, and West generally recorded increases.

The widespread pattern of these increases suggests that some common factor was involved. Because no general increases in particulate emissions throughout these areas occurred in 1976 and there were no widespread changes in sampling methodology, meteorological conditions would be the likely candidate for explaining these increases. Many state agencies ranging from the Midwest to Washington and California have cited meteorology as the main reason for these TSP increases in 1976. Large areas of the country experienced drought during 1976 and these extremely dry soil conditions increase the likelihood of wind blown dust contributing to ambient TSP levels. Dry soil conditions did, in fact, exist in these general areas that had TSP increases.

Sulfur Dioxide (SO_2)

The entire sulfur dioxide picture has changed in the 1970s. The early 1970s saw dramatic decreases in ambient sulfur dioxide levels in the nation's urbanized areas. Since then the national trends have been much more stable and violations of the sulfur dioxide standard are generally confined to local areas around specific sources.

In comparing changes between 1970-1973 and 1974-1976, 64 percent of the sites remained below 26 ug/m^3 throughout. For the other sites, 51 percent showed improvement and 23 percent reported increases. In contrast to TSP, levels between 1975 and 1976 are relatively stable with 11 percent of the sites increasing, 12 percent decreasing, and 76 percent either showing no change or remaining below 26 ug/m^3.

As in the case of TSP, meteorology is likely to have an effect on short-term changes. For sulfur dioxide, heating degree days are an important meteorological parameter and reflect fuel usage for space heating. Therefore, short-term increases may be due to changes in emissions associated with varying meteorology. This type of effect was seen in Minnesota where fall quarter sulfur dioxide levels in 1976 were 17 percent higher than the corresponding quarterly averages for 1973-1975; at the same time, heating degree days increased 23 percent due to colder weather.

Urban sulfur dioxide levels have traditionally been higher in the Northeast and Great Lakes areas due to emissions associated with space heating. However, New England had no violations of the sulfur dioxide standards in 1976. In Michigan, only four counties reported violations of the sulfur dioxide standards. In Illinois, 1976 was the first year in the history of the Illinois EPA that no site violated the sulfur dioxide annual primary standard.

The general improvement in sulfur dioxide levels is indicative of trends in urban areas. At the present time, the remaining problem with attainment of the sulfur dioxide standard is primarily associated with specific sources impacting their surrounding areas. The EPA has not yet taken action to control ambient sulfate levels or acid rain.

Carbon Monoxide (CO)

There has been general improvement in carbon monoxide levels through 1976. The historical data base for CO is very limited compared to TSP and sulfur dioxide. However, the nationwide data base continues to expand as a result of the increased monitoring activities of state and local agencies during the 1970s. For example, in 1975, 102 sites had three or more years of data while 202 sites met the criteria in 1976. California, with its well established monitoring program, remains the major contributor to the CO data base with 59 sites qualifying as trends sites.

During the 1970-1976 period, approximately three-fourths of the CO sites showed improvement. In comparing 1975 and 1976 values, 52 percent of the sites showed improvement, 39 percent had increases, and 9 percent were unchanged. Forty-nine percent of the sites reported their all time low value in 1976.

Photochemical Oxidants (O_x)

Photochemical oxidants are one of the most serious and pervasive air pollution problems in the country. In 1975 86 percent (356 of 416) of the oxidant sites reporting to the National Aerometric Data Bank exceeded the National Ambient Air Quality Standard (NAAQS) of 160 ug/m^3 not to be exceeded more than one hour per year.

The amount of oxidant trend data available remains limited for most areas due to the absence of data prior to 1972 or 1973. The overall data picture is getting better with the number of trend sites steadily increasing nationwide.

For example, last year there were about 20 trend sites outside of California; there are now 112 sites meeting EPA criteria. In total, 174 sites representing 34 states qualified for the trend analysis - 62 of these in California together with the 112 sites in other states. Almost one-half of the California sites were located in the immediate Los Angeles (15 sites) and San Francisco (8 sites) metropolitan areas.

Table II-1 shows the distribution of 3 categories of trend direction (down, no change, up) by California and other state sites. The overall picture obtained from the California sites is one of a steady unchanging pattern of oxidant concentrations from 1970-1976. The sites outside California show a little more tendency for increasing patterns--55 sites with "up" patterns and 46 sites with "down" patterns. Eleven sites showed "no change" patterns. For the most part, these sites represent only three years of data. Therefore, assessing the significance of these patterns is difficult.

Table II-1. OXIDANT/OZONE TRENDS IN THE 90th PERCENTILE OF THE ANNUAL HOURLY OBSERVATIONS 1970-76

Direction of Trend	California Sites	Other State Sites	Total
Down	24 (39%)	46 (41%)	70 (40%)
No Change	16 (26%)	11 (10%)	27 (16%)
Up	22 (35%)	55 (49%)	77 (44%)
Total	62 (100%)	112 (100%)	174 (100%)

Nitrogen Dioxide (NO_2)

Trends in the annual mean concentrations of nitrogen dioxide are available for 276 sites throughout the country for the period 1970-1976. Forty-two of these sites were located in California.

Among the 42 California sites, 19 showed decreases and 19 reflected increases in concentration. Other states, however, show almost twice as many sites (145 to 77) with up then down patterns. Most of these sites (228 out of the 234), however, had only three years of data so that it is impossible now to draw any definite conclusions from these findings.

AIR MONITORING STRATEGY

In September, 1977, EPA published the final report, "Air Monitoring Strategy for State Implementation Plans," which was prepared by the Standing Air Monitoring Work Group (SAMWG), composed of EPA and state and local control agency personnel. The SAMWG identified several areas where monitoring deficiencies exist. The major areas of concern included:

(1) In some cases, more monitoring stations are being reported to the national data bank than are necessary.

(2) Existing regulations do not allow states sufficient flexibility for short term studies.

(3) Resource constraints and diversity of data needs frequently result in untimely or incomplete reporting of air quality data.

(4) Lack of uniformity in station location and probe siting, sampling methodology, quality assurance practices and data handling procedures have resulted in data of unknown quality and comparability.

The SAMWG prepared a set of recommendations which are being adopted by EPA. The recommendations include:

(1) An expanded quality assurance program.

(2) A modification to existing monitoring regulations to provide for:
    a. A carefully planned network of State and Local Air Monitoring Stations (SLAMS) whose size and distribution is largely determined by the needs of state and local air pollution control agencies.
    b. A small but well-defined core of National Air Quality Trend Stations (NAQTS) to minimally meet national needs for trend and SIP evaluations.
    c. A plan for Special Purpose Monitoring (SPM) tailored to augment data from NAQTS and SLAMS.

(3) A revision to existing ambient reporting regulations which would limit the data being submitted to the National Air Data Bank to that which is necessary for national assessment of trends and development and evaluation of national control policies.

During FY 1978 the EPA Regional Offices and the states will cooperatively develop state plans for implementing SAMWG's major ambient air monitoring recommendations. Since some agencies will require significant changes in their air quality surveillance activities, full implementation of the above accomplishments may require 3-5 years.

New requirements of the Clean Air Act are also being added to the ambient monitoring regulations which will require the states to report to the public on the daily air quality in all major urban areas through the use of uniform air quality criteria and methodology and a uniform air quality index. The revised regulation's proposed index is the Pollutant Standards Index which was developed through the efforts of the Federal Task Force on Air Quality Indicators.

III. DEVELOPMENT OF AIR QUALITY CRITERIA AND STANDARDS

INTRODUCTION

Air quality criteria documents were issued for particulate matter, sulfur oxides, hydrocarbons, photochemical oxidants, carbon monoxide, and nitrogen oxides in the period from January, 1969, through January, 1971. On April 30, 1971, subsequent to issuance of the criteria, EPA established primary and secondary National Ambient Air Quality Standards (NAAQS) for these pollutants.

On September 14, 1973, EPA revised the standards by revoking the annual secondary standard for sulfur dioxide and revising the Air Quality Criteria for Sulfur Oxides. The maximum 24-hour concentration published as a guide for implementation plan development purposes was deleted. EPA also proposed an ambient standard for lead in December, 1977.

These revisions have been the only changes to the Federal criteria and standards to date. Reevaluation of the criteria and the NAAQS was mandated by the 1977 Clean Air Act Amendments, and EPA has developed a schedule for complying with this requirement. The 1977 Clean Air Act Amendments require EPA to set a short-term NO_2 standard, if warranted, by August 8, 1978.

HEALTH EFFECTS RESEARCH

Research Approach

Research on health effects is fundamental to the Agency's responsibility and ability to develop criteria and to promulgate and enforce standards and guidelines. EPA health effects research is specifically designed to identify pollutants which may pose a risk to health, to quantify the relationship between exposure to those pollutants and their effects on health, and to document the benefits of reducing or eliminating human exposure through pollution control.

In the health effects research program, data bases are developed for determining whether restricting exposure to particular pollutants is necessary to protect public health and, if so, to what degree exposure should be restricted. To do this, a combination of research approaches is used: toxicological studies which utilize animal models, controlled human studies, and epidemiological studies of human populations in their actual environmental settings. Each of these study areas provides an important set of data to assess possible adverse health effects that might result if humans are exposed to air pollutants.

In the toxicologic studies, animals are exposed to both high and low concentrations of selected pollutants and combinations of pollutants under various experimental conditions. These results provide indications of whether there is likely to be an acute and/or chronic adverse effect if people are exposed to the pollutants. The laboratories use and are developing new rapid and less expensive screening techniques to identify those compounds that are important candidates for whole animal toxicologic studies.

For those pollutants that can be tested on human subjects (the Agency has been and continues to be extremely conservative in any human testing programs), the toxicologic results are used to help design the human studies. The toxicologic studies will indicate how, where, and at what concentrations humans are likely to show responses to the pollutant exposure. With the toxicologic and controlled human studies, dose-response curves can be constructed that are important for establishing safe ambient air levels of human exposure to the pollutant(s) under study.

The epidemiologic study area provides important data for health effects-based air standards. Here, real world data are obtained, whereas in the laboratory real world conditions are only simulated. However, the many compounding variables such as smoking, occupation and diet present in the real world make the results obtained from epidemiologic studies semi-quantitative at best. By having good toxicologic and controlled human exposure health effects data, the epidemiologic studies can be designed to focus on those biological indicators that are sensitive to variations in the concentration of the pollutant of interest.

The health effects research program is divided into four pollutant areas: studies on criteria pollutants, non-criteria pollutants, pollutants associated with transportation activities, and non-pesticide organic and inorganic substances found in air.

Criteria Pollutants

Criteria pollutants are those for which National Ambient Air Quality Standards (NAAQS) have been set under §109 or have been listed under §108: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulates (TSP), hydrocarbons (HC), photochemical oxidants (O_x), and lead (Pb). The Agency is continuing to obtain health effects information on these pollutants in several areas, such as exposure averaging times (i.e., short-term, high-concentration exposure versus long-term, low-level exposure), the adequacy of existing safety margins, the health benefits of meeting the standards, and the health risks of exceeding the standards. Thus, the research in this area is basically directed toward expanding the health data base for those pollutants for which NAAQS have been promulgated and refining the criteria on which those standards are based.

Recent investigations indicate that exposure to 1200 ug/m^3 (0.6 ppm) ozone for 2 hours, coupled with moderate exercise, produces significant pulmonary complaints as well as significant decrements in pulmonary functions. Most subjects exposed to ozone complained of cough, substernal chest pain, shortness of breath, and a decreased ability to maximally inspire. A few subjects continued with symptoms several hours post-exposure.

Animal toxicologic studies were conducted on NO_2 to evaluate whether the mode of exposure might play an important role in the toxicological effect of NO_2. Investigators used continuous and intermittent animal exposure studies to determine the relationship between biological response and length of exposure to various concentrations of NO_2. When a constant dose level was employed, exposure to a high concentration administered over a short period produced a greater effect than exposure to a lower concentration administered over a longer period. Results of these studies indicate that the frequency and amplitude of short-term peaks are of significance even though the exposure is interrupted with periods of zero concentration of NO_2.

In the area of carbon monoxide health effects all projected tasks dealing with human behavior have been completed and performance data analyzed. These EPA studies were factored into a comprehensive literature review and critique indicating ambient CO concentrations do not significantly impair human behavior and task performance.

The Dallas Traffic Study, designed to determine the relationship between automobile traffic density and the body burden of lead and to determine the effects of varying traffic conditions on air lead levels, is completed. Statistically significant relationships between traffic density and airborne lead levels were observed. (Additional discussion of research dealing with lead is included in the section on inorganic and organic substances below.)

Non-Criteria Pollutants

Non-criteria pollutants are those for which no NAAQS have been established. Health effects research is also directed toward developing data on these pollutants, e.g., sulfates, nitrates, and respirable particulates. Some existing evidence associates these pollutants with harmful effects on human health. Questions being posed in this regard include determination of exposure-response relationships for these pollutants, both by themselves and in combination with other pollutants. Most of the research effort has focused on sulfates.

This work includes developing and obtaining data from biological screening systems, determining the metabolic pathways and target organs, understanding responses and mechanisms, and establishing dose-response data. Within each area, consideration was given to the various sulfate compounds and their relative toxicities, cation-anion relationships (positively and negatively charged ions), compound physical characteristics such as size and bioavailability, concentration and time duration of exposure, and combined or synergistic effects with other pollutants.

Tentative results indicate that the cation is an important contributor to compound toxic effects because the cation may enhance the absorption of the sulfate ion into the cells of the lung. Other data indicate that the irritant effects of sulfuric acid are associated with the submicron sulfuric acid particles. Further data indicate that the deposition location of sulfuric acid in the lungs is similar to that region of the lung where irritation from deposited material results in coughing, bronchitis, and asthma.

A series of animal toxicology projects studied the effects of the sulfuric acid (H_2SO_4) alone and in combination with other substances on the host's defense mechanism. Combinations were studied because they sometimes have additive or synergistic adverse health effects worse than might be predicted from the study of either substance alone.

Animals exposed sequentially to ozone (O_3) and H_2SO_4 and then to an aerosol of micro-organisms suffered an increase in mortality although neither pollutant alone caused an increase. Long-term exposure to H_2SO_4 adsorbed onto carbon resulted in increased susceptibility to infectious disease. In a study aimed at understanding carcinogenic effects, lung tissue exposed to SO_2 in combination with benzo(a)pyrene (a hydrocarbon) showed that benzo(a)pyrene changed to end-products which differed from those found when lung tissue was exposed to benzo(a)pyrene alone. This result is being pursued.

In-house studies on sulfuric acid aerosols evaluated the effects on humans of a range of particle sizes and concentrations. Extramural work extended the range of particles studied to provide a data base which more closely resembles conditions found in the ambient air.

In support of obtaining accurate measurements of what the individual study population subjects are exposed to, instrumentation for in situ sulfur particulate measurement and species characterization was evaluated. The fraction of respirable sulfates was determined by comparison of 24 hour sulfate samples from high volume samplers with samples from the CHAMP (Community Health Air Monitoring Program) respirable sampler. Human exposure models are being developed for sulfates and other pollutants to estimate the variability in exposure due to mobility and time spent indoors and outdoors. Work is continuing to develop biological indices for quantifying specific human health effects from exposure to sulfur-containing atmospheric pollutants. Potential sites for sulfate epidemiological studies are being reviewed to identify areas where sulfate levels and human health effects can be quantitatively related.

When this groundwork is completed, the study populations will be selected. Using biological indicators that are sensitive to sulfate pollutant exposure, the epidemiologists will attempt to relate ambient sulfate levels and adverse health effects, if there is any relationship.

Transportation-Assoc ited Pollutants

The purpose of e research program on transportation-associated pollutants is to develo a comprehensive data base to evaluate the public health consequences non-regulated pollutants from mobile sources. The principal effort in 77 focused on sulfuric acid emissions from oxidative catalyst control dev es. Animal toxicologic studies were conducted to develop information the effects that were observed at various concentrations of inhaled sul ric acid. The effects studied included increased susceptibility to pu onary bacterial infection. Animals were also exposed to dilute ex ust from a catalyst-equipped light duty engine. The pulmonary effect of inhaled combinations of sulfuric acid and metal sulfates were studie and sulfuric acid mist concentrations in the lung were measured.

The second annu l Catalyst Research Program Report was completed and represents a compreh sive compilation of information obtained by the research program on obile source emissions. The work includes data on emission characteriz tion, atmospheric chemistry, and physics of mobile emission products wi consideration given to meteorology and other atmospheric factors; air ality modeling; analytical instrumentation development; animal toxicol gy; and human population effects. Pollutants of concern include sulf ric acid, platinum, and palladium. The data obtained is being provided to ppropriate sectors of the Agency to indicate the public health implic tions of non-regulated mobile source pollutants.

Inorganic and Organi Substances

Research is bei conducted to determine the threat to human health from exposure to hea y metals including lead, copper, zinc, and other substances not class fied as pesticides. An attempt is being made to identify the populat on-at-risk and specific health effects. The present emphasis of this pro ram is to identify high exposure populations preceding extensive health eff cts studies. This is being accomplished by relating the human body burde s of inorganic metals to environmental exposure of individuals living i areas of high traffic density or residing near lead, copper, or zinc smel ers.

An assessment of exposure-effects relationships is being made using laboratory animals. These studies involve heavy metals or other nonpesticide substances which have been identified as potentially harmful to human health. Emphasis is on chronic, low-level exposure of animals through several generations to assess the teratologic, reproductive, and behavioral effects of the stresser. In addition, whole-body retention, organ distribution, and in vitro investigations complement these dose-effects studies.

TERRESTRIAL ECOLOGY EFFECTS OF AIR POLLUTION

With increased national dependence on fossil fuels, agricultural production could suffer severe yield losses if air quality standards continue to be established on the basis of constant non-variable SO_2 concentration experiments. Extensive and repeated experimentation on the yield response of agricultural crops to non-variable SO_2 concentrations within the range of 0 to 0.15 ppm showed no yield reduction. However, within the same range of median concentrations (0-0.15 ppm) naturally varying season long SO_2 exposures produced yield losses in excess of 50% in the most sensitive species. These relationships of crop yield to a range of median SO_2 concentrations will be useful in (a) setting realistic air quality standards, (b) developing regional air pollution diffusion models for predicting environmental impact, and (c) assessing economic impact of SO_2 on a regional or area basis as a prelude to establishing regional air quality standards.

In SO_2 experiments using variable SO_2 concentration exposures, two onion varieties (white and yellow) were either severely stunted in growth (less than 10% the weight of controls) or killed by a median SO_2 concentration of 0.15 ppm. Growth reductions of the two onion varieties were 40 and 15% respectively, when exposed continuously during the full growth period to a median SO_2 concentration of 0.08 ppm. Exposure to an atmosphere with a median SO_2 concentration of 0.15 ppm reduced radish top and root growth by 40 and 60% and alfalfa top and root growth by 30 and 60%, respectively, compared to controls. Root and top growth of beet, a resistant species, was not affected by exposure to the above SO_2 concentrations.

In further efforts to support the establishment of a long term (chronic) secondary air quality standard, alfalfa plants were exposed to various median concentrations of SO_2, (0, 0.02, 0.06, 0.15, 0.20, 0.30 ppm) for 68 days. The threshold for significant effects on growth and symbiotic nitrogen fixation was 0.02 ppm SO_2; at 0.06 ppm they were reduced 50 and 40% respectively and the reductions increased to 95 and 90% respectively at a median SO_2 concentration of 0.30 ppm. Growth reductions were also associated with significant increases in total sulfur in the plant. These results suggest that the present secondary air quality standard for SO_2 may not adequately protect public welfare.

On a strategy level, the above research will provide a basis for establishing more realistic air quality standards for SO_2 which would focus regulation activities on source strength rather than ground level concentration. This possibility exists because median SO_2 concentration in the ambient atmosphere is directly related to source strength and median SO_2 concentration is also one of the best predictors of expected crop yield losses.

Another major environmental problem associated with the increased utilization of coal is the acidification of precipitation. Effects research in this area of concern is providing support for the development of air pollution control strategies related to sulfate emissions. Controlled field studies using pH values typical of rainfall acidities occurring and expected in the U.S. are yielding preliminary significant results related to soil litter decomposition, nutrient cycling and plant growth. Initiation of expanded research on whole ecosystem effects of acid precipitation is planned for FY 78.

Recent studies concerning interactive, synergistic effects of sulfur dioxide (SO_2) and ozone (O_3) applied as gas mixtures at low concentration levels have demonstrated the need to reassess existing single pollutant standards to more realistically reflect ambient air pollution stress.

Alfalfa, broccoli, cabbage, radish, tomato, and tobacco plants were exposed to O_3 (0.05-0.1 ppm), SO_2 (0.1-0.5 ppm) or a combination of SO_2 and O_3 for up to 4 hours and foliar necrosis was measured. Foliar injury (percent leaf area injured) from exposure to O_3 was generally less than 20%; from SO_2 exposures it was generally less than 10%. All combinations of SO_2 and O_3 caused foliar injury (5 to 60%) while many of the individual concentrations of either SO_2 or O_3 did not. Approximately 50% of the interaction exposures caused more injury than would be expected from the sum of the separate effects of SO_2 and O_3.

In another experiment, alfalfa, radish, soybean, and tobacco plants were exposed 4 to 6 weeks to O_3 (0.05 ppm), SO_2 (0.05 ppm) or a combination of SO_2 and O_3 and yields (oven dry weight tops) were measured. Yield reductions in the test species ranged from 0-50% for O_3, 0-20% for SO_2 and 0-55% for the combination of SO_2 and O_3. The effects on radish and soybean were additive while the effects on alfalfa and tobacco were greater than additive.

A major effort in terrestrial ecology during FY 77 resulted in a significant contribution to the Agency's first draft of the updated Air Quality Criteria for Photochemical Oxidants and Oxidant Precursors, dated September 1977. Scheduled for completion early in 1978, this document includes two chapters related to vegetation and ecological effects of photochemical oxidants. Also included are approximately 70 scientific publication citations resulting from research conducted or supported by the EPA research and development program in terrestrial ecology effects of air pollution. Cited results on effects of .05 ppm O_3, 5 hr/day for 68 days in reducing alfalfa growth (45%) and symbiotic nitrogen fixation (40%) suggest that current secondary air quality standards may not adequately protect public welfare.

In another study, ponderosa pine seedlings were exposed to ozone at a concentration of 10 pphm 6h/day, 7 days/week for variable periods up to 22 weeks. Significant reductions were observed in stem (21.3%) and root (26.3%) dry weight of plants exposed for full term. Measurements of metabolic pools (amino acids, soluble sugars, starch and phenols) within top and root tissue showed significant decreases in these metabolites in roots as early as 12 weeks following initiation of exposure. This evidence suggests that ponderosa pine and other ozone sensitive tree species undergo an invisible reduction in vigor when exposed to chronic low levels of photochemical oxidants. This pollution stress likely results in predisposing affected trees to other natural environmental stresses including insects, diseases, drought, and freeze injury.

Extended studies of biogenic emission rates of reactive hydrocarbons from selected plant species suggest that vegetation may be a significant source of photochemical oxidant precursors. Data from oak indicate that during daylight hours isoprene production rates can range from 30-80 ug/dm^2/hr. During mid-day hours, isoprene emissions from live oak were extrapolated to be approximately 14.3 Kg/Km^2/hr.

Production of ethylene by plants under air pollution stress has proven to be a sensitive bioassay (indicator) for evaluating the toxicity of various criteria and non-criteria pollutants. Pine, eucalyptus, soybean, lupine, tomato, wheat, lily, rhododendron, corn, holly, and marigold were exposed to O_3 (0.1-1.0 ppm), SO_2 (0.5-4 ppm), $SO_2 + O_3$ and Cl_2 (0.1-1.0 ppm) for 2 hours. Measured increase in stress ethylene production was 20-80%. The increase occurred before visual injury, but was correlated with it. Stress ethylene measurements were less variable and more reproducible than foliar injury estimates.

IV. STATUS OF STATE IMPLEMENTATION PLANS (SIPs)

DESIGNATION OF NONATTAINMENT AREAS

The Clean Air Act Amendments of 1977 were signed into law by President Carter on August 7, 1977. They require that states designate the attainment status of all areas within 120 days of the signing of the amendments.

EPA must then evaluate these state designations and publish a list of area designations by February 3, 1978. Should EPA disagree with the state on a designation, the state must be given an opportunity to refute any EPA findings before the list is published.

This list is significant because of the state implementation plan (SIP) requirements for nonattainment AQCRs. The designation as a nonattainment area carries with it the requirement for submittal of a SIP revision for that area by January 1, 1979, with the use of all reasonably available control measures demonstrating that attainment will be achieved by December 31, 1982. In the case of photochemical oxidants (Ox) and carbon monoxide (CO), an extension up to December 31, 1987, is possible if attainment by 1982 is demonstrated to be impossible and if certain conditions are met. In addition, a nonattainment designation required the application of the December 21, 1976, Interpretative Ruling on new source review (emission offset policy) until July 1, 1979, for that area. (See "Review of New and Modified Sources" following in this chapter.)

There are four possible designations for an area for the criteria pollutants of total suspended particulates (TSP) and sulfur dioxide (SO_2): nonattainment of primary standards, nonattainment of secondary standards, unclassifiable, and attainment. The "unclassifiable" designation is to be used for those areas where insufficient data exists to permit a judgment to be made. For carbon monoxide (CO), oxides of nitrogen (NO_x) and hydrocarbons (HC), the possible classifications are nonattainment of primary standards, attainment, or unclassified.

REVIEW OF NEW AND MODIFIED SOURCES

One of the major mechanisms available to control potential increases in stationary source emissions is new source review (NSR). Through various forms of NSR, states can control and/or condition the location and amount of pollutant emissions generated by new or modified industrial sources of air pollution. Regulations generally take the form of both emission limitations and ambient constraints. The latter involves safeguarding ambient air quality standards--both the primary and secondary NAAQS and the air quality increments established to prevent significant deterioration of air quality (PSD). Many of these review programs are implemented by different agencies.

Sources subject to these regulations are required to obtain approval prior to construction. Upon application, the reviewing agency is required to conduct an extensive analysis of the meteorology, topography, industrial process, and pollutant characteristics of each major source. From this analysis, predictions can be made of the potential impact that the proposed source may have on local, and in some cases distant, air quality.

SIP new source review regulations require disapproval of any new or modified air pollution sources which would either fail to meet an emission limit or interfere with attainment and maintenance of the NAAQS. All but five states now have regulations completely approved as part of their SIPs to conduct preconstruction NAAQS reviews for new sources. However, since the NAAQS attainment date (1975) has passed without attainment, some questions arose in 1976 concerning the legality of any new source construction in such nonattainment areas.

EPA published a formal interpretation of Section 110 of the Clean Air Act on December 21, 1976, to allow major point sources to locate or modify existing operations in non-attainment areas but only after restrictive emission controls have been applied and more than equivalent offsetting emission reductions from existing sources have been made in order to accomplish reasonable progress toward attainment.

The Clean Air Act Amendments of 1977 indicated that the December 21, 1976, Interpretative Ruling (with certain modifications) remains in effect until the states submit and EPA approves an implementation plan revision which meets the new requirements of Part D of the Act. The modifications to the Interpretative Ruling will be proposed in early 1978.

The 1977 Amendments did, however, provide a waiver to the Interpretative Ruling. To date only Texas has requested a waiver from the offset requirements. However, on or after July 1979, approval of new or modified sources may be granted only if the permits are in conformity with the 1977 Amendments.

The 1977 Amendments also made changes with respect to the Agency's prevention of significant deterioration (PSD) regulations. The new statutory strategy, which is generally more comprehensive and restrictive than EPA's regulatory program, was not to be fully effective until the state and/or EPA undertake further rulemaking activities. Such rulemaking activities began with a proposal on November 3, 1977, to change the Agency's current regulations regarding PSD and to establish requirements for the preparation, adoption and submittal of State Implementation Plans for PSD. Public comments have been requested on the proposed regulations and a final promulgation is expected by March of 1978.

NATIONAL AMBIENT AIR QUALITY STANDARD FOR LEAD

EPA proposed a national ambient air quality standard for lead in December, 1977, under authority of Section 109 of the Clean Air Act pursuant to a court order in NRDC et al vs Train.

Lead exposure is not solely through air but through a combination of sources including food and water. The aggregate contribution of lead from all these sources poses a significant threat to health. EPA had previously determined that the most appropriate approach to controlling airborne lead was reduction of lead in gasoline via Section 211 of the Clean Air Act and control of selected stationary sources under Section 111 of the Act. Even though this strategy was being implemented, the Court decision on March 1, 1976, in NRDC et al vs Train required EPA to list lead as a criteria pollutant in accordance with Section 108 of the Act. The criteria document and the proposed standard were issued in December, 1977.

TRANSPORTATION CONTROL MEASURES

The Clean Air Act, as amended, specifically requires the use of transportation control measures where necessary to meet national ambient air quality standards for carbon monoxide and photochemical oxidants. EPA has approved or promulgated transportation control plans in 31 demonstrably deficient areas; 9 additional areas are developing transportation control plans as a result of more recent air quality data.

Although no entire transportation control plan has been implemented to date, many metropolitan areas have made good faith efforts to adopt and implement transportation control measures. These measures include both transportation control strategies, such as inspection/maintenance, transit improvements, employer incentives, traffic management/restraints, and parking management/restrictions, and stationary source control measures such as vapor recovery for gasoline marketing.

Some of the problems associated with transportation control planning should be remedied by the Clean Air Act Amendments of 1977. The amendments call for publication of a number of information documents related to transportation control strategies. EPA has begun compiling these documents which will analyze the environmental, energy, and economic impact of various transportation control strategies and, thus, should be of great help to state and local governments as they develop their new or revised state implementation plans. In addition, the amended Act calls for the publication of planning process guidelines which will aid state and local officials in developing necessary institutional arrangements so that integrated transportation/air quality planning procedures may evolve. Finally, the Clean Air Act Amendments authorize appropriate financial and programmatic sanctions which can be used against states who are not following their implementation plans.

In spite of the problems hindering the implementation of transportation control plans, progress has been made in implementing individual transportation control measures. For example, five California cities as well as Portland, Oregon and Seattle, Washington are developing parking management plans. Commuter parking restrictions have been successfully implemented in Washington, D. C. and Arlington, Virginia. Several cities, such as Philadelphia, Washington, D.C., Los Angeles, and San Francisco, have inaugurated new bus lanes or priority bus/carpool lanes to provide better mass transit service, while other cities, such as Newark and Seattle, are instituting "parking freeze areas" to discourage the use of automobiles in center city areas. Still other cities, such as San Diego, are well advanced toward full implementation of gasoline recovery regulations. In areas where employer mass transit incentive regulations are in effect, numerous large industries have submitted information describing their plans for reducing single occupancy auto commuter trips by their employees. Finally, transportation control plans have been developed for several Texas cities.

INSPECTION/MAINTENANCE

Inspection/maintenance (I/M) programs require the testing of motor vehicle emissions with respect to certain standards and the subsequent maintenance and retest of vehicles that fail.

State legislative activity on I/M has increased in 1977. Colorado passed a bill requiring inspection of all 1977 and later model year vehicles of gross vehicle weight (GVW) of 8500 pounds or less in 9 "Front Range" counties, including Denver and other major cities. Testing is to begin on January 1, 1980. Nevada passed a mandatory I/M bill for Clark County (Las Vegas) and Washoe County (Reno). There currently is an I/M program in Clark County for vehicles undergoing change of ownership. The new legislation expands this program to fully mandatory I/M by July 1, 1979, in both counties.

Additional legislative efforts in other states are expected in 1978, such as Connecticut, Kentucky and Minnesota. In addition, Missouri and other states will likely consider I/M systems appropriate for their jurisdictions.

Rhode Island was expected to start implementing a private garage-based program in November, 1977. Inspections will be required while maintenance will be voluntary until January, 1979, when maintenance will be mandatory also.

California made a significant step toward mandatory I/M for the entire six-county Los Angeles metropolitan area. On June 30, 1977, the state awarded a contract to Hamilton Test Systems of Windsor Locks, Connecticut to run a change-of-ownership I/M system. Testing is scheduled to begin on January 1, 1979.

Following a November, 1976, statewide referendum approving the program, Arizona implemented fully mandatory I/M in January, 1977. Maricopa and Pima Counties, encompassing Phoenix and Tucscon and a majority of the state's automobiles, are included.

The passage of the Clean Air Act Amendments of 1977 could signal the beginning of substantial new progress in the implementation of I/M programs. The Act states that for nonattainment areas states have until December 31, 1982, to provide for the attainment and maintenance of the National Ambient Air Quality Standards. States must submit State Implementation Plan (SIP) revisions by January 1, 1979, which accomplish this goal. If attainment of Ox and CO standards cannot be reached in 1982, states may have an extension to December 31, 1987, if they make a demonstration to that effect and they include SIP revisions for the implementation of all reasonable measures including a schedule for the implementation of I/M. This Congressional endorsement of I/M as a viable control strategy should do much to encourage the establishment of I/M programs.

INDIRECT SOURCE REVIEW

The Clean Air Act Amendments of 1977 clarify two issues concerning indirect source review. An indirect source review program is defined as facility-by-facility review of such sources. Review programs include measures that are necessary to assure, or assist in assuring, that pollutants emitted from mobile sources associated with the source do not result in or contribute to air pollutant concentrations exceeding a national ambient air quality standard.

The first issue affects the regulatory requirements for an indirect source review (ISR) program as a part of a state implementation plan (SIP). The Administrator may no longer require an indirect source review program as a condition for approval of a plan. Although an indirect source review program is no longer a condition for approval of a SIP, a state may still adopt and submit such a program to the EPA as part of its plan. Fourteen states or territories currently have indirect source review programs approved as a part of their SIPs.

The second issue dealt with by the amendments concerns the authority of the Administrator to promulgate, implement and enforce indirect source review regulations. This authority is applicable only to indirect sources which are Federally assisted, owned or operated. The Administrator has not made a decision to proceed with regulations and the rulemaking process under this authority.

EMERGENCY EPISODE REPORTING

The 1977 Amendments to the Clean Air Act will require the reporting of the following information on emergency episodes in the annual report to Congress:

1. The status of plan revisions providing for episode contingency plans or providing for necessary legal authority to enforce contingency plans.
2. An accounting of states failing to develop contingency plans.
3. The number of emergency episodes by location, date, pollution source, and duration.
4. Contingency plan measures taken and an evaluation of their effectiveness.
5. An accounting of any episodes during which no contingency plan actions were taken and an explanation of why no actions were taken.

This information will be included in this report next year.

PERMIT FEE REGULATIONS

The newly amended Act also requires that owners of major stationary sources will be required to pay fees sufficient to cover the costs of reviewing any application for a permit.

Currently, only a few states collect fees for air pollution permits. In many cases the program is a county or city function. The new permit fee program will have to reflect the intent of the Act to cover reasonable costs incurred by the states related to significant deterioration and visibility protection.

V. INTERGOVERNMENTAL RELATIONS

FEDERAL SUPPORT OF STATE AND LOCAL PROGRAMS

Status of State, Interstate and Local Pollution Control Agencies Funding

The EPA administers and coordinates the Federal environmental programs with state and local levels of government to assure the most effective partnership arrangement for the solution of common environmental problems. As part of the Federal, state and local government sharing of responsibility, the Federal government provides support through assignment of personnel, special contractual arrangements, and grants.

In 1977, 55 state and territorial agencies and 230 local agencies, working in coordination with the states, expended approximately $174 million and 7270 man-years to carry out the national air pollution control effort. Tables V-1 and V-2 illustrate the extent of Federal support to state and local agencies by organizational location of the agency within the state and local governmental structures and by jurisdictional areas served by these agencies. The figures show an increased level of total expenditures with an increased state and local funding and expenditure of monies by the various levels of government that resulted in a small change of man-years of effort.

Federal Financial Assistance to Air Pollution Control Agencies

In 1977 EPA provided financial assistance to 54 state agencies (all except American Samoa) and 116 local agencies. In addition, 39 local agencies received Federal monies through specified provisions of state grants or special contractual assistance. The total expenditures of these 209 agencies represented approximately 89 percent of all expenditures for the 285 agencies having some air pollution control responsibilities. The support provided to the agencies was in the form of grants for planning, developing, establishing, improving or maintaining control

Table V-1. TYPES OF STATE AND LOCAL ORGANIZATIONS RECEIVING FEDERAL FUNDS

Types of Organizations	1975				1976				1977			
	Total	No. receiving Federal funds		No. operating without Federal funds	Total	No. receiving Federal funds		No. operating without Federal funds	Total	No. receiving Federal funds		No. operating without Federal funds
		State	Local			State	Local			State	Local	
Environmental	43	22	13	8	46	22	16	8	49	23	18	8
Health	132	17	87	28	120	15	74	31	110	16	71	23
Air Pollution	94	6	52	36	99	7	54	38	106	5	63	38
Natural Resources	7	7	-	-	8	8	-	-	8	8	-	-
Other	15	2	10	3	17	1	8	8	12	2	2	8
Total	291	54	162	75	290	53	152	85	285	54	152	77

Table V-2. STATE AND LOCAL CONTROL AGENCIES[1] ESTIMATED 1975, 1976 AND 1977 EXPENDITURES (Dollars in Thousands)

	Jurisdictional category Local				Subtotal state agency	Total[2]
	Cities	Counties	Multi-county	Subtotal		
1975 Expenditures						
Number agencies	44	91	27	162	54	216
Total dollars	$19,400	$31,300	$12,100	$62,800	$81,000	$143,800
Federal dollars	5,900	10,400	3,100	19,400	33,200	52,600
State/local dollars	13,500	20,900	9,000	43,400	47,800	91,200
1976 Expenditures						
Number agencies	44	79	29	152	53	205
Total dollars	$21,400	$20,600	$25,000	$67,000	$83,000	$150,000
Federal dollars	5,800	8,400	6,700	20,900	34,400	55,300
State/local dollars	15,600	12,200	18,300	46,100	48,600	94,700
1976 TQ Expenditures[3]						
Number agencies	11	47	20	78	43	121
Total dollars	$ 1,300	$ 2,100	$ 1,500	$ 4,900	$13,600	$ 18,500
Federal dollars	650	1,300	1,000	2,950	7,400	10,350
State/local dollars	650	800	500	1,950	6,200	8,150
1977 Expenditures						
Number agencies	36	91	28	155	54	209
Total dollars	$16,800	$20,800	$30,300	$67,900	$91,600	$159,500
Federal dollars	5,900	7,500	7,000	20,400	36,300	56,700
State/local dollars	10,900	13,300	23,300	47,500	55,300	102,800

[1] Total number of agencies receiving Federal monies for air pollution control work either directly or by designation in grant to state agency. Direct grants approximate 182 for 1975 and 169 for 1976 and 1977.

[2] In 1977, 77 agencies did not receive Federal funds. These agencies and state contributions to related air pollution activities accounted for approximately $15 million in air pollution work, making the total estimated expenditures $174 million in 1977.

[3] A number of agencies were provided a three-month funding (transition quarter--TQ) during either 1976 or 1977 to change the Federal grant period from a July 1 to June 30 fiscal year to a Federal fiscal year of October 1 to September 30.

programs. This support also included temporary Federal assignees, special contractual assistance and demonstration grants.

Resources of State and Local Air Pollution Control Agencies

Total expenditures (Federal, state, local) for the support of air pollution have grown from $13 million in Fiscal Year 1965 (FY 65) to an estimated $174 million (including agencies not receiving any Federal support) in FY 77. The growth rate for Federally-funded agencies in FY 77 was approximately 6 percent over the FY 76 level and 11 percent for all agencies.

The increase in the number of employees of state and local control agencies is an indicator of the nation's growing commitment to controlling air pollution. Table V-3 shows that control agency staff has almost doubled in the last six years. The 1977 on-board positions represent approximately 7270 equivalent full-time man-years of effort.

Resources increased by approximately 150 man-years and $9.5 million between June, 1976 and October, 1977. The state and local fund increase of approximately nine percent ($8.1 million) represented a significant increase over the 1976 level. Federal support of these agencies increased by approximately three percent ($1.4 million). Although the monetary increases represent an increasing growth rate over 1976, the growth in positions and man-years was less than previous years, thus reflecting inflationary costs of salaries and agency operations.

The focus of Federal support to state and local control agencies has been on the implementation of SIPs and the associated national priorities. In FY 77 control agencies reviewed their strategies and made changes to operational and procedural methods to improve enforcement actions for achieving standards. Their resources were devoted not only to traditional monitoring and enforcement programs but also to developing increasingly complex control programs constrained by energy trade-offs, social and economic considerations, and analysis and studies pertaining to attainment and maintenance of standards.

The estimated percentage of resources committed to various aspects of these national efforts to attain and maintain the standards is shown in Table V-4.

Table V-3. ESTIMATED MAN-YEARS OF EFFORT EMPLOYED BY STATE AND LOCAL AIR POLLUTION CONTROL AGENCIES[a]

Fiscal year	State		Local		Total state/local	
	Positions	Man-years	Positions	Man-years	Positions	Man-years
1969	1000	920[b]	1840	1660[b]	2840	2580[b]
1971	1540	1420[b]	2630	2370[b]	4170	3790[b]
1973	2930	2760	3270	2990	6200	5750
1974	3970	3490	3270	3000	7240	6490
1975	4030	3500	4010	3300	8030	6800
1976	4140	3770	4170	3340	8310	7110
1977[c]	4420	3840	3970	3430	8390	7270

[a] Agencies receiving funds directly or through "pass through" provision in state grant for all years. Also includes estimates for non-funded agencies for 1975, 1976 and 1977.

[b] Estimated from position information using man-year/position ratios from 1973 and 1974.

[c] 1977 estimates based on preliminary information.

Table V-4. ESTIMATED DISTRIBUTION OF RESOURCES DEVOTED TO AIR POLLUTION CONTROL ACTIVITIES OF NATIONAL PRIORITY BY STATE AND LOCAL CONTROL AGENCIES[a] IN FYs 75-77

Activity	Estimated percentage of resources		
	FY 75	FY 76	FY77 (Prelim.)[b]
Compliance with State Implementation Plan Regulations[c]	44	40	44
Development and Implementation of Revisions to and Completion of SIPs	6	8	10
Transportation Control Plans and Mobile Source Inspection and Investigation	7	7	6
Ambient Air Quality Monitoring Network Operation and Completion	18	22	19
Supportive Activities (Management, data and policy review, environmental impact statements, training, etc.)	25	23	21

[a] Estimates are based on a total estimated expenditure of $143 million for FY 75 , $150 million for FY 76, and $159 million for FY 77.

[b] Outputs changed in 1977 to place emphasis on maintaining standards and performing attainment and maintenance analyses. It is estimated that approximately six percent of supportive activities were devoted to these attainment and maintenance studies.

[c] Majority of activities in this category deal with stationary source control although some transportation control activities are included.

Federal Assistance in Training Air Pollution Manpower

To assist and improve operations of state and local air pollution control agencies, EPA's own operating programs, other Federal agencies, and the private sector in their performance in implementing the Clean Air Act, EPA conducts short-term technical training courses and workshops. During 1977, a total of 86 training courses of 3 to 10 days duration were conducted on 23 different subjects. Thirteen workshops were conducted on seven different subjects. A total of 2345 students participated in 8590 student-days of training in short courses and workshops. In addition to these courses, 170 students were awarded certificates for completion of self-instructional courses on 4 different subjects. The students attending the short-term training courses and workshops represented a variety of agencies and private entities, as indicated in Table V-5.

Table V-5. ATTENDANCE AT SHORT-TERM TECHNICAL TRAINING COURSES AND WORKSHOPS

Employer	Number of students Training courses	Workshops
EPA	438	110
Other Federal agencies	70	11
State governments	619	119
Local governments	342	106
Consulting firms	47	20
Industry	314	44
Foreign countries	56	6
Others	20	23
Total	1,906	439

A series of training course materials was prepared on the maintenance of emission control systems on motor vehicles. These materials can be used by vocational schools and other organizations in the training of auto mechanics, which is an essential element in the success of motor vehicle emission inspection/maintenance programs. In addition, technical and training assistance was provided to many organizations on the establishment of mechanic training programs for low emission engine maintenance.

EPA provides funds for university training of employees of state and local governmental air pollution control agencies and others as a means of assisting agencies in improving the efficiency and effectiveness of their operations and to augment recruitment and retention capabilities. The funds are provided as fellowships to individuals and as grants to universities. During 1977, EPA provided fellowships to 89 control agency employees for part-time studies, for 27 control agency employees for full-time study, and for 10 other individuals for full-time study. Recipients of the training benefits came from 22 state and 30 local air pollution control agencies. Collectively, the fellows were attending 55 different universities. Graduate level training grants to 13 universities included direct support for 52 students and provided modest support to the universities in their programs of teaching in the air pollution field. Many other students not directly supported by EPA took the courses supported by the grants.

Grants were also made to 3 universities to support special programs in training of about 60 students in environmental management, to provide summer internships in air pollution work for 25 students, and to provide assistance in the use of a computer simulation training exercise.

Federal Assistance in the Utilization of Technical Literature

EPA provides assistance to state and local governmental air pollution control agencies (as well as to commercial enterprises, consulting firms, universities and others) in their use of information contained in the technical literature. In 1977, more than 400 computerized literature searches for state and local agencies and other organizations were conducted and more than 37,000 copies of technical publications were provided in response to about 14,000 requests from a wide variety of individuals and organizations. In addition, about 1,400 computerized searches were made of the EPA air pollution technical information file which is accessible through a commercial system under a contract with EPA.

INTERAGENCY COOPERATION

The Clean Air Act Amendments of 1977 provide for interagency cooperation in several areas. They require greater consultation and coordination on planning and implementation between state air pollution control agencies and local governments as well as Federal land managers. This includes the organizations responsible for comprehensive planning, transportation planning, and other related programs such as water quality management. At the same time, the Act requires that other Federal plans and programs support air quality planning and not approve, present or support any program which is contrary to an approved plan.

Specifically, the Act calls for consultation with the Department of Housing and Urban Development (HUD) and the Department of Transportation (DOT) on the development of planning process guidelines for non-attainment areas and for cooperation with DOT in publishing information on transportation control measures.

Federal land managers, which includes the Department of the Interior, the Department of Agriculture and other Federal agencies, are heavily involved in the prevention of significant deterioration and review any new source permit which may affect a Class I area.

The Department of the Interior, working with other affected agencies, is also required to identify all mandatory Class I areas where visibility is an important value. Stationary sources in these areas are subject to retrofitting to improve visibility.

The requirements of the new amendments will augment earlier actions taken by EPA to consult with other Federal agencies and coordinate or integrate related programs. These include efforts to integrate air quality planning with the 3C transportation planning process through the inclusion of air quality related measures in the annual Transportation System Management (TSM) element required by DOT from metropolitan planning organizations and through the annual 109(j) consistency determination between proposed highway plans and transportation control plans.

In 1977 EPA and HUD signed an interagency agreement which addresses coordination between air quality planning and the "701" comprehensive planning program. Regulations issued by HUD make it a condition of approval of such plans that they be consistent with state air quality implementation plans.

A committee was established in 1977 with membership from the Department of Interior, the Department of Agriculture and EPA. The committee has developed a list of mandatory Class I areas where visibility is an important value and is also identifying potential Class I areas. The committee will also establish criteria for determining whether a proposed facility will have an adverse impact on air quality related values.

INTERNATIONAL COLLABORATION IN CONTROL OF AIR POLLUTION

Air pollution control was an important international environmental theme in 1977, both bilaterally and multilaterally.

The Economic Commission for Europe (ECE) held the first meeting of its Steering Body for the ECE Cooperative Program to Monitor and Evaluate Long-range Transmission of Air Pollutants. The Steering Body established Eastern and Western coordinating centers for the program in Norway and the Soviet Union, respectively, which became operational by the end of the year. Sulfur dioxide monitoring sites were selected, as well as the types of measurements to be made. The Steering Body meeting and start-up of the program represented important steps in the international examination of sources and transport of air pollution.

Complementing ECE's effort, the Air Management Group of the Organization for Economic Cooperation and Development (OECD) analyzed potential strategies to effectively control the long-range transport problem. OECD also spent 1977 examining techniques and strategies to control photochemical oxidants through its precursors and for control of NO_x in its own right.

As the WHO Collaborating Center for Environmental Pollution Control, EPA continued to operate the data bank for the WHO/Global Environmental Monitoring System (GEMS) air quality monitoring project. A similar service was provided to the World Meteorological Organization for its Atmospheric Turbidity and Precipitation Chemistry networks. This year, too, EPA assisted WHO in producing its GEMS report, "Air Quality in Selected Urban Areas, 1975."

NATO's Committee on the Challenges of Modern Society (CCMS) approved a new project on flue gas desulfurization, at the United States' suggestion. For the first phase of the study, twelve separate flue gas desulfurization processes were examined in terms of performance, capital and operating costs, residuals and general applicability.

Perhaps the single most significant multilateral event associated with air pollution was the International Meeting on Regulation of Chlorofluorocarbons, April 26-28, 1977, sponsored by the United States. Held at EPA's initiative, the meeting was a response to concern over the stratospheric ozone depletion threat posed by chlorofluorocarbon emissions. Twelve governments and four international organizations met to review the science of the problem, the economic impacts of possible regulation, and the status of national and international plans to control fluorocarbons.

A number of air pollution activities took place in 1977 on a bilateral basis. EPA continued to cooperate with Canada and Mexico in monitoring air pollution, conducting research into control strategy mechanisms, and in negotiating specific control devices and procedures for individual industrial sources of pollution. Concern regarding possible increased air pollution as a result of U.S. conversion to coal has been expressed by Canada; efforts are being made to coordinate air programs between the two countries. U.S. and Canadian experts held initial discussions on the desirability of establishing a program of cooperative research on the problem of long-range transport of air pollutants and their effects on human health and welfare.

Under the International Joint Commission, whose function it is to help resolve potentially contentious issues between the United States and Canada, the Air Advisory Board and the special Ontario-Michigan Air Board have been actively addressing major air pollution issues along the northern border.

Cooperative surveillance and monitoring programs have begun to be established along the southern border between U.S. and Mexico on a case-by-base basis. The programs coordinate local, state and Federal projects.

Under the U.S.-Japan Environmental Agreement there are three active projects: photochemical air pollution, air pollution-related meteorology, and stationary source pollution control technology. Exchanges are also taking place within the U.S.-Federal Republic of Germany Agreement on flue gas desulfurization, air quality planning and maintenance, and air pollution from coal-fired installations.

Air pollution projects under the U.S.-U.S.S.R. Environmental Agreement include Air Pollution Modeling and Standard Setting; Instrumentation and Measurement Methodology; Process Improvement and Modification; Ferrous Metallurgy Pollution Control Technology, Gaseous Emission Abatement Technology; Particulate Abatement Technology; Transportation Source Control; and Effects of Atmospheric Pollution on Climate. Research work continued to be carried on to develop industrial processes which will produce less air pollution: desulfurization and demetallization of fuel oils, dry quenching of coke, and flotation desulfurization of coal.

Cooperative research with other countries is also conducted under the provisions of the Agricultural Trade Development and Assistance Act of 1954, as amended. In the area of air pollution abatement and control, EPA is presently cooperating with three countries: Egypt, Poland, and Yugoslavia. These projects encompass practically all environmental aspects of air pollution, including identification of specific pollutants, development of control technologies to be used by industry, procedures for monitoring ambient air conditions, and assessment of health-related problems. For example, in Egypt studies are being made to assess the biological effects of inhaling high concentrations of air borne particulates; Polish investigators are examining the complex relationships between increases in air pollution toxicity and changes in elevation; also in Poland investigations are being carried out to determine industrial influences in particulate pollution in the atmosphere; and a project in Yugoslavia is directed toward the control and abatement of air pollution in the granular fertilizer industry.

VI. CONTROL OF STATIONARY SOURCES

NEW SOURCE PERFORMANCE STANDARDS

The Clean Air Act, as adopted in 1970, requires the Administrator to establish national standards of performance for source categories that "may contribute significantly to air pollution which causes or contributes to the endangerment of public health or welfare." The 1977 Amendments to the Act reinforced this requirement and established a schedule for the promulgation of standards of performance for remaining source categories. Future reports will reflect the Administrator's progress in meeting this new schedule. This report will contain a summary of accomplishments from 1970 through 1977.

Table VI-1 provides a listing of the source categories for which standards of performance have been promulgated. It also shows the affected facilities regulated in each source category and the number of applicable standards. Generally, an affected facility is that process within a source category for which a new source standard has been promulgated. In some cases, standards are established for multiple pollutants from the same facility.

Table VI-1 also provides a listing of the source categories for which standards of performance have been published for comment in the Federal Register. These proposed standards are applicable to all sources constructed after the date of proposal, but they are not effective until promulgated. Through calendar year 1977, 83 standards have been published for 22 source categories and 63 affected facilities.

Details as to the affected facilities, pollutants, and dates of proposal and promulgation are provided in Table VI-2.

Through calendar year 1977, litigation has occurred for five standards; of these, two have been decided in favor of the Administrator and two are under remand. Opinions upholding the regulations have been rendered by

TABLE VI-1

NEW SOURCE PERFORMANCE STANDARDS

(As of October, 1977)

Promulgated NSPS	No. of Affected Facilities	No. of Source/ Pollutant Combinations*
Steam Generators >250 MM Btu/hr (Gas, Oil, Coal-Fired)	3	9
Municipal Incinerators >50 TPD	1	1
Portland Cement Plants	2	2
Nitric Acid Plants	1	1
Sulfuric Acid Plants	1	2
Asphalt Concrete Plants	1	1
Petroleum Refineries	2	3
Petroleum Storage Tanks (>40,000 gal)	3	3
Secondary Lead Smelters	3	3
Secondary Brass & Bronze Refining	3	3
Iron and Steel Mills	2	2
Sewage Treatment Plants	1	1
Primary Copper Smelters	4	5
Primary Zinc Smelters	2	4
Primary Lead Smelters	6	7
Primary Aluminum Reduction	2	4
Coal Cleaning Plants	2	2
Phosphate Fertilizer Plants	5	5
Ferroalloy Production	1	2
SUBTOTAL	45	60
Proposed NSPS		
Kraft Pulp Mills	8	11
Petroleum Refineries	1	2
Steam Generators >250 MM Btu/hr (Lignite-Fired)	1	2
Grain Elevators	5	5
Lime Plants	2	1
Gas Turbines	1	2
SUBTOTAL	18	23
TOTAL	63	83

*Opacity standards not counted separately if there are particulate standards for that facility.

TABLE VI-2

STATUS OF SECTION 111 REGULATIONS
(As of October, 1977)

SOURCE	AFFECTED FACILITY	POLLUTANT	OPACITY REGULATION	PROMULGATION DATE	REMARKS
Steam Generators [>250 million Btu/hr]	Coal, oil, & gas-fired boilers	Particulate	✓	12/23/71	Under remand. 8/17/71- Proposed
	Coal and oil-fired boilers	SO_x			
	Coal, oil, & gas-fired boilers	NO_x			
Municipal Incinerators [>50 tons per day]	Incinerator	Particulate		12/23/71	
Portland Cement Plants	Kiln, clinker cooler	Particulate	✓	12/23/71	Judicial review decided in favor of EPA - 5/22/75.
Nitric Acid Plants	Process equipment	NO_x	✓	12/23/71	
Sulfuric Acid Plants	Process equipment	SO_x		12/23/71	Under remand.
		Acid Mist	✓	12/23/71	
Asphalt Concrete Plants	Process equipment	Particulate	✓	3/8/74	NAPA & Warren Bros. Co. suit decided in favor of EPA by US Court of Appeals 7/21/76.

STATUS OF SECTION 111 REGULATIONS

SOURCE	AFFECTED FACILITY	POLLUTANT	OPACITY REGULATION	PROMULGATION DATE	REMARKS
Petroleum Refineries	Process gas combustion	SO_x		3/8/74*	
	Catalytic regenerators	Particulate	✓	3/8/74*	8/30/76 - Proposed opacity standard revision.
		CO		3/8/74*	
Petroleum Storage	Gasoline, crude oil, and distillate storage tanks >40,000 gallons capacity	Hydrocarbons		3/8/74*	
Secondary Lead Smelters and Refineries	Blast and reverberatory furnaces	Particulate	✓	3/8/74*	11/18/75 - Proposed opacity reevaluation.
	Pot furnaces		✓		
Secondary Brass and Bronze Refining Facilities	Reverberatory furnaces	Particulate	✓	3/8/74*	11/18/75 - Proposed opacity reevaluation.
	Electric and Cupola		✓		
Iron and Steel Mills	Basic oxygen furnace	Particulate		3/8/74*	3/2/77 - Proposed opacity amendments,
Sewage Treatment Plants	Sludge incenerators	Particulate	✓	3/8/74*	
Primary Copper Smelters	Roaster, smelting furnace, converter	SO_x	✓	1/15/76	Proposed 10/16/74
					*Proposed 6/11/73.

STATUS OF SECTION 111 REGULATIONS

SOURCE	AFFECTED FACILITY	POLLUTANT	OPACITY REGULATION	PROMULGATION DATE	REMARKS
Primary Zinc Smelters	Roaster	SO_x	✓	1/15/76	Proposed 10/16/74
	Sintering machine	Particulate	✓		
Primary Lead Smelters	Sintering machine, electric smelting furnace, converter	SO_x	✓	1/15/76	Proposed 10/16/74
	Blast or reberberatory furnace, sintering machine discharge end	Particulate	✓		
Primary Aluminum Reduction Plants	Pot lines	Fluorides	✓	1/26/76	Proposed 10/23/74 In litigation.
	Anode Bake Plants	Fluorides	✓		
Coal Cleaning Plants	Air Tables	Particulate	✓	1/15/76	Proposed 10/24/74
	Thermal dryers	Particulate	✓		
Phosphate Fertilizer Plants	Wet Process Phosphoric Superphosphoric acid Diammonium phosphate Triple superphosphate prod. Triple superphosphate stor.	Fluorides Fluorides Fluorides Fluorides Fluorides		8/6/75	
Iron and Steel Mills	Electric arc furnaces	Particulate	✓	9/23/75	
Ferroalloy Production	Specific furnaces	Particulate CO		5/4/76	Proposed 10/21/74

STATUS OF SECTION 111 REGULATIONS

SOURCE	AFFECTED FACILITY	POLLUTANT	OPACITY REGULATION	PROMULGATION DATE	REMARKS
Phosphate Fertilizer Plant 111(d)	Wet process phosphoric	Fluorides		3/1/77	Proposed 5/12/76
	Superphosphoric acid	Fluorides			
	Diammonium phosphate	Fluorides			
	Triple superphosphate prod.	Fluorides			
	Triple superphosphate stor.	Fluorides			
Standards In Preparation for Promulgation					
Kraft Pulp Mills	Digesters, lime kiln, recovery furnace, washer, evaporator, strippers, smelt & BLO tanks	Total reduced sulfur (TRS)			Proposed 9/24/76
	Recovery furnace, lime kiln, smelt tank	Particulate	✓ (recovery furnace)		
Sulfur Recovery in Petroleum Refineries	Sulfur recovery plants	SO_2 Sulfides			Proposed 10/4/76
Petroleum Refineries - Reevaluation of Opacity Standards	Process gas combustion Catalytic regenerators		✓		Proposed 8/30/76
Lignite Fired Steam Generators	Lignite-fired boilers	Particulate NO_x	✓		Proposed 12/22/76

STATUS OF SECTION 111 REGULATIONS

SOURCE	AFFECTED FACILITY	POLLUTANT	OPACITY REGULATION	PROMULGATION DATE	REMARKS
Sulfuric Acid Plants 111(d)	Existing process equipment	Acid Mist			Proposed 11/4/76
Grain Elevators	Receiving, conveying, cleaning, drying, and shipping facilities	Particulate	✓		Proposed 1/13/77 Suspended 6/24/77
Lime Plants	Rotary kiln, hydrator	Particulate			Proposed 5/3/77
Gas Turbines	Turbine	NO_x SO_x			Proposed 10/3/77
Continuous Monitoring General Provisions				10/6/75	Proposed 9/11/74
Section 111(d) Regulations (General Provisions)				11/17/75	Proposed 10/7/74
Modification (General Provisions)				12/16/75	Proposed 10/15/74
Reference Methods 1-8 Amendments (Test Methods)				8/18/77	Proposed 6/8/76
Reference Method 11 Revision (Test Method)					Proposed 5/23/77
Reference Methods 13A and B Amendments (Test Methods)				11/29/76	

the U.S. District Court of Appeals for the District of Columbia in National Asphalt Pavement Association et al vs. Train (9/21/76) and the National Portland Cement Association et al vs. Ruckelshaus (5/22/75). Final opinions concerning standards of performance for steam generators and sulfuric acid plants are imminent; litigation on primary aluminum plants is currently active.

During 1977 a major portion of the resources committed to new source performance standards was used for technical studies of additional source categories. Studies are underway for sulfur recovery plants in oil and natural gas fields, iron and steel mill sintering plants, stationary internal combustion engines, dry cleaning plants, organic solvent degreasing, lead battery manufacturing, iron ore beneficiation, auto and light truck surface coating, selected industrial surface coating operations, non-metallic minerals mining, crushing and screening, industrial boilers, and glass manufacturing. In addition, a major effort was initiated in 1977 to gather data to review the new source performance standards for coal-fired steam generators.

Control of Volatile Organic Chemicals

During 1977 emphasis was placed on the preparation of guidance materials which reflect reasonable available control technology (RACT) for volatile organic chemicals emitted from a source category. The purpose of the RACT guidance documents is to provide a technical data base to be used by the states to develop specific regulatory requirements in non-attainment air quality control regions. Table VI-3 provides a listing of the documents issued in 1977 and those scheduled to be issued in the future.

Section 111(d) Standards

During 1977 guidelines for the control of sulfuric acid mist from sulfuric acid plants were finalized. This action initiated the development and submission of state plans for the control of acid mist from existing plants. A similar action was also finalized for the control of fluoride emissions from five types of phosphate fertilizer plants.

Table VI-3. CONTROL TECHNIQUES GUIDELINES FOR VOLATILE ORGANIC COMPOUNDS ISSUED IN 1977 AND SCHEDULED TO BE ISSUED [1/]

SOURCE CATEGORY	NATIONWIDE EMISSIONS, 1,000 metric tons/yr
Issued in 1977	
Large Appliance Manufacture	35
Magnet Wire Insulation	10
Gasoline Bulk Plants	150
Metal Furniture Manufacture	100
Petroleum Liquid Storage, Fixed Roof Tanks	700
Degreasing	700
Bulk Gasoline Terminals	250
Petroleum Refinery Vacuum Systems Wastewater Separators and Process Unit Turnaround	700
Cutback Asphalt Paving	700
Surface Coating of Automobiles, Cans, Metal Coils, Paper and Fabric Products	900
Service Stations, Stage I	400
To Be Issued in Future	
Petroleum Refinery Fugitive Emissions (Leaks)	150
Surface Coating of Other Metal Products - Industrial	200
Pharmaceutical Manufacture	50
Rubber Products Manufacture	150
Paint Manufacture	25
Vegetable Oil Processing	15
Graphic Arts (Printing)	400
Flat Wood Products	50
Service Stations, Stage II	500
Petroleum Liquid Storage, Floating Roof Tanks	150

Table VI-3 (continued). CONTROL TECHNIQUES GUIDELINES FOR VOLATILE ORGANIC COMPOUNDS ISSUED IN 1977 AND SCHEDULED TO BE ISSUED [1]

SOURCE CATEGORY	NATIONWIDE EMISSIONS, 1,000 metric tons/yr
Ship and Barge Transport of Gasoline and Crude Oil	60
Organic Chemical Manufacture	
Process Streams	450
Fugitive (Leaks)	600
Dry Cleaning	250
Wood Furniture Manufacture	200
Architectural and Miscellaneous Coatings	300
Organic Chemical Manufacture	
Waste Disposal	150
Storage and Handling	300
Natural Gas and Crude Oil Production	200
Natural Gas and Natural Gasoline Plants	150
Adhesives	200
Other Industrial Surface Coatings	300
Auto Refinishing	150
Other Solvent Usage	3,000
Metals Manufacture	} 4,000
Other Manufacturing	
Fuel Combustion	
Forest, Agricultural and Other Open Burning	
Solid Waste Disposal	
TOTAL STATIONARY SOURCES	16,700,000 metric tons per year
TOTAL TRANSPORTATION SOURCES	10,600,000 metric tons per year

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[1] This inventory was developed from national production and consumption information using average emission factors. The technique necessarily requires assumptions that cannot be confirmed in every case. We anticipate that the figures will change as better information is developed and generalized categories such as "other solvent usage" are more clearly defined.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

On November 16, 1976, the Environmental Defense Fund petitioned the court for review of the vinyl chloride standards. As a result of this petition, amendments were proposed on June 2, 1977. The basic thrust of the proposal was to tighten the standards.

In 1977 it was determined that some decorative sprays contained significant quantities of asbestos which presented a hazard to building occupants. An amendment to the existing NESHAP on asbestos to prohibit the use of such sprays was proposed on March 2, 1977. Promulgation is expected shortly. In addition, the writing of a guidance document on ways to remove asbestos coatings from buildings was initiated. This document also contains information on the possibility of treating existing coatings to prevent the release of asbestos to the environment. Additional studies are underway concerning the control of asbestos from rock crushing and handling and the beneficiation of iron ore.

During 1977, benzene was listed as a hazardous air pollutant. Regulations for several source categories are under development. Because of the complex array of benzene sources, the NESHAP will be issued in a phased program starting in mid-1978 and continuing into 1982.

Studies are also underway to prepare regulations for coke oven emissions and arsenic emissions from primary copper smelters if they are listed as hazardous air pollutants.

DEVELOPMENT OF NEW AND IMPROVED AIR POLLUTION CONTROL TECHNIQUES FOR STATIONARY SOURCES

One of EPA's most important tasks is the development and demonstration of air pollution control technologies for stationary sources. The Agency's goals in developing stationary source controls include:

> Describing at least one environmentally sound method of control for each major source of pollution, including development and demonstration, if necessary;
>
> Providing a technical base for the Agency's enforcement activities;
>
> Establishing technical and economic data to support New Source Performance Standards (NSPS); and

Providing information upon which to base an environmentally sound energy development policy.

Sulfur Oxides (SO_x)

The Agency has directed much of its research and development effort in the sulfur dioxide (SO_2) control area toward demonstrating flue gas desulfurization (FGD) technology, in which SO_2 is removed from the gas stream emitted after a fuel is burned. Flue gas desulfurization technology is the only near-term technological approach to utilizing plentiful high-sulfur coal supplies without excessive deleterious SO_2 emissions. FGD technology development and assessment, therefore, have a high priority.

FGD technology has progressed rapidly over the past four years. Several commercial FGD installations are achieving high SO_2 removal efficiency with good reliability. EPA believes that lime and limestone FGD processes can now be considered demonstrated technology, capable of being confidently applied to full-scale utility boilers. However, more work remains to be done in the FGD technology area, including the development of a cost-effective and environmentally acceptable disposal technology for the large quantities of sludge produced from lime and limestone systems, the development and demonstration of improved lime and limestone process variations which will minimize cost and energy usage and improve sludge properties, and the development and demonstration of economically viable regenerable FGD systems producing sulfur and sulfuric acid instead of sludge.

For the last eight years, EPA has been conducting a comprehensive FGD development and technology transfer program which has been instrumental in accelerating the commercial viability of FGD technology. This program has aimed at demonstrating reliable and cost-effective FGD processes, yielding both nonregenerable (throwaway) products and regenerable (or salable) sulfur products.

EPA's major program in the nonregenerable area is the lime/limestone prototype test program operating in cooperation with the Tennessee Valley Authority at the latter's Shawnee Steam Plant. This program has been instrumental in identifying reliable, cost-effective process variations for both lime and limestone scrubbing systems.

Also in the nonregenerable FGD area, EPA has initiated a comprehensive program aimed at identifying environmental problems associated with scrubber sludge disposal, along with development and evaluation of appropriate control practices. In order to provide a nonregenerable alternative to lime/limestone systems, EPA is now undertaking the demonstration of the double-alkali scrubbing process on a full-scale coal-fired boiler.

In the regenerable FGD area, EPA has pursued an aggressive program aimed at identifying cost-effective processes with wide applicability producing salable sulfur products. EPA is working with the Department of the Interior in developing sodium citrate scrubbing, a promising regenerable system. Other regenerable processes which have proven to be promising are being evaluated on full-scale coal-fired utility boilers as part of EPA's FGD demonstration program: Wellman-Lord (producing sulfur), magnesium oxide (producing sulfuric acid), and the aqueous carbonate process (producing sulfur).

EPA is also studying a number of other approaches for reducing sulfur oxide emissions. One such approach is to "clean" a fuel (to remove the sulfur and other contaminants) before the fuel is burned. This pretreatment method is especially suited to sources smaller than electric utilities, e.g., industrial boilers and commercial fuel-burning equipment. One technique involves physically and/or chemically cleaning coal with moderate sulfur content so that it can be burned in conformance with clean air standards.

The Agency is also studying the use of clean liquid and gaseous synthetic fuels derived from coal. A program on residual oil processing and utilization aims at defining better means of removing sulfur and other pollutants in producing a clean synthetic fuel.

Another approach to reducing SO_x emissions is to adsorb the gas during the combustion process. The Agency's efforts in combustion modification have involved primarily the Fluidized Bed Combustion Process (FBC). These efforts have contributed to the National Fluidized Bed Combustion Program, an interagency program coordinated by the Department of Energy. EPA's contributions to the interagency program consist of environmental assessments of FBC systems--which control SO_x, NO_x, fine particles, and other pollutants--and continued testing of its small (0.53 megawatt) FBC mini-pilot plant. The Agency also conducts independent research to determine the implications of alternative designs and of alternative uses of fluidized bed combustors.

Nitrogen Oxides (NO_x)

The development of the technology needed to control NO_x focuses on the combustion process itself, where NO_x pollution starts. No_x emissions from combustion can be reduced by as much as 75 percent by "combustion modification" (lowering the combustion temperature, limiting the amount of oxygen available and regulating the way the fuel and air mix). Fundamental research into the basic chemical and aerodynamic mechanisms involved in combustion is increasing understanding of the factors that cause formation of NO_x and of methods for controlling NO_x without increasing emissions of other pollutants. Along with fundamental research, EPA also sponsors advanced research into new low-NO_x designs for combustion equipment, alternate fuels, and advanced combustion concepts.

Another major component of the NO_x control program is pilot-scale testing. Here, a wide variety of combustion modification techniques have been evaluated under controlled conditions in the laboratory.

Field demonstrations are the last--and in many ways the most important--step in EPA's combustion modification control program. This is where techniques that appear promising in the laboratory are evaluated on full-scale equipment to ensure they can do the job under actual working conditions. The result is reliable control technology that equipment manufacturers and users can count on.

The Agency has underway more than 30 separate programs to develop effective and economical ways of controlling NO_x. They cover all the major types of stationary sources in the United States, from small home furnaces to large utility boilers.

EPA has already taken some important steps toward developing NO_x control technology. Promising accomplishments over the last two years include the following research:

- Combustion modification techniques for coal-fired utility and large industry boilers that reduce NO_x emissions by 40 to 50 percent with no adverse side effects.

- Pilot-scale test of advanced pulverized coal burners for utility and large industrial boilers that lower NO_x emissions by 70 to 80 percent.
- A residual oil burner for small industrial boilers that cuts NO_x emissions by 65 to 70 percent from heavy oils with high nitrogen content.
- An oil-fired home furnace that reduces NO_x emissions by 70 percent without increasing carbon monoxide, hydrocarbons, or smoke.
- Field tests proving that NO_x emissions from small industrial boilers can be lowered significantly by combustion modification techniques and by firing methanol instead of natural gas or heavy oils.
- Pilot-scale tests of an advanced catalytic combustion system capable of reducing emissions of NO_x, carbon monoxide, and hydrocarbons by as much as 95 percent.

Another important part of the Agency's program is the NO_x flue gas treatment (FGT) program. The FGT program has two main elements: strategy/technology assessment and experimental projects.

The strategy and technology assessment element is designed to produce a detailed state-of-the-art technology assessment, an assessment of the extent to which FGT could be used in an optimized control strategy for stationary sources, and information concerning the economic, energy, and environmental aspects of commercial application of FGT technology. The experimental projects element will provide the development and demonstration of FGT technology for removal of NO_x with both high and low SO_x concentrations and for simultaneous removal of both NO_x and SO_x.

Particulates

The Agency's program for particulate control is conducted to establish engineering design techniques and performance models and to improve the collectability and economics of control devices for particulate matter.

Attainment of the current primary standard for particulates in some cases will be difficult and expensive with existing technology; attainment of the secondary standard appears impossible without improved technology.

There are two basic causes for this: particulate control technology has limited control capability, in many cases even for coarse particulates; and technical and economic factors often prevent control technology from being feasible in specific industrial applications.

EPA is placing increased emphasis on the control of fine particulates which persist in the atmosphere, comprise a variety of known toxic substances, and are major contributors to atmospheric haze and visibility problems. The objective is the development and demonstration of control technologies capable of effectively removing large fractions of the under-3-micron size particles from effluents. The technical approach is to identify capabilities of existing equipment (electrostatic precipitators (ESPs), filters, scrubbers, and proprietary devices), to determine deficiencies in present design and operating procedures, and to pursue remedies for the deficiencies through research and development. New concepts are applied as discovered and successful advancements in removal technology will be demonstrated.

Actual source tests have shown that both ESPs and baghouses should be capable of controlling fine particulates from a limited number of sources emitting fly ash. It is quite possible that the applicability of ESPs to fine particulate control over a broad range of sources can be extended by developing dust conditioning techniques and by modifying the design of charging sections and collecting electrodes. Recently, a complete mathematical model for the design of ESPs was greatly improved; this will allow cost-effective design for specific particulate control technology applications. Also completed was the demonstration on actual sources at a pilot scale of a charged droplet scrubber, a high throughput fabric filter, and a flux force/condensation scrubber. In addition, a major effort was initiated to find solutions to the particulate emission problems associated with the burning of, or switching to, low-sulfur coal by a number of electric utilities.

Other Pollutants

"Other" pollutants include those pollutants for which no ambient air quality standards have been established and those pollutants for which no National Emissions Standards for Hazardous Air Pollutants (NESHAPS) now exist. Control technology research efforts are underway for a number of these pollutants, including trace metals, polycyclic organic matter (POM), miscellaneous hydrocarbons, fluorides, and odors.

To assess the emission levels of these pollutants, several tasks are underway for the field testing of coal-fired utility and industrial boilers and for limited source characterization of gas- and oil-fired units. A field testing program is underway for residential and commercial heating units.

Source assessments are also undertaken for certain chemical processing industries. This program is conducted to assess the environmental impact of sources of toxic and potentially hazardous emission from organic materials, inorganic materials, combustion and open source categories, and to determine the need for control technology development for given source types. Sources under assessment include petroleum refining, petrochemicals, nitrogen fertilizer operations, phosphate fertilizer operations, and pesticides manufacturing.

Control technology for ferrous metallurgical industries is under continuing development. EPA has completed projects directed toward the control of emissions from cokemaking, blast furnace tapping, and charging of basic oxygen furnaces. Efforts are being made to develop full control of emissions from the sintering of iron ore. Extensive efforts are also underway to assess, and ultimately to bring under control, fugitive emissions from all significant sources in the production of metallurgical products. The combining into a multimedia program of the previously separated ferrous metallurgical air and water research and development programs should result in optimum control of all discharges from these industries.

VII. CONTROL OF MOBILE SOURCE EMISSIONS

INTRODUCTION

Title II of the Clean Air Act,as amended in 1970, mandated at least 90 percent reductions in carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NO_x) emissions from light-duty vehicles and delegated authority to the Administrator to prescribe certain other emission standards for automobiles, trucks, aircraft, and motorcycles.

MEASURES TAKEN TO IMPLEMENT MANDATED TITLE II EMISSION STANDARDS

Clean Air Act Amendments of 1977

The Clean Air Act Amendments signed into law on August 7, 1977, deal, in part, with questions of mobile source emission standards for the 1978 model year and beyond. Under the former law, final standards governing the three major pollutants from the tailpipe were to be met by model year (MY) 1978. These standards in grams per vehicle mile were HC, 0.41; CO, 3.4; and NO_x, 0.4. Congress determined, however, that it was not possible for the auto industry to meet these standards by MY 1978 and established a revised schedule of emission standards. The emission standards currently applicable for passenger cars, light- and heavy-duty trucks, and motorcycles are outlined in Tables VII-1 and VII-2.

The 1977 Clean Air Act Amendments also require that EPA promulgate heavy-duty truck (HDT) regulations requiring a 90 percent reduction in HC and CO emissions for MY 1983 and a 75 percent reduction in NO_x emissions for MY 1985. These standards are to be derived from baseline emissions of 1969 MY gasoline heavy-duty engines. Interim standards for these emissions are required, reflecting the available technology with consideration given to cost, noise, energy and safety factors. Standards have been promulgated by EPA for the interim years. (See Table VII-2)

Table VII-1. EMISSION STANDARDS FOR MOTOR VEHICLE CLASSES
(Light Duty Passenger and Trucks)

Motor vehicle class	1978			1979			1980[i]			1981[i]		
Light duty passenger (Emissions expressed in grams per mile)	HC	CO	NOx	HC	CO	NOx	HC	CO	NOx	HC	CO	NOx
National	1.5[a]	15	2.0	1.5[a]	15	2.0	.41[a]	7	2.0	.41[a]	3.4[b]	1.0[c]
California I	.41[d]	9	1.5	.41[d]	9	1.5	.41[e]	9	1.0 (1.5[f])	.41[a]	3.4	1.0 (1.5[f])
California II[g]										.41[h]	7	0.7
Light duty trucks (Emissions expressed in grams per mile)												
National (0-6000 GVW for 1978) (0-8500 GVW for 1979 +)	2.0	20	3.4	1.7	18	2.3	1.7	18	2.3	1.7	18	2.3
California	Standards vary depending upon weight and purpose.											

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[a] Total hydrocarbon standard without methane correction factor.
[b] Waiverable to 7.0 (to 1983).
[c] Waiverable to 1.5 for diesels or for innovative technology (diesel waiver expires in 1984).
[d] Total hydrocarbon standard with methane correction factor.
[e] Total hydrocarbon standard with methane correction factor. Standard is .39 if non-methane instrumentation is used.
[f] If certified by the CARB, optional 100,000 mile durability procedure.
[g] Second set of standards is optional - to be selected for a two-year period by manufacturer.
[h] Total hydrocarbon standard without methane correction factor. Standard is .39 if non-methane instrumentation is used.
[i] California waiver request for 1980 and later model year light duty truck (LDT) and medium duty vehicles (MDV) has not yet been approved by the Administrator.

Table VII-2. EMISSION STANDARDS FOR MOTOR VEHICLE CLASSES
(Heavy Duty Trucks and Motorcycles)

Motor vehicle class	1978					1979					1980				1981			
Heavy duty trucks	HC	CO		HC+NOx	Smoke	HC	CO		HC+NOx	Smoke	HC	CO	HC+NOx	Smoke	HC	CO	HC+NOx	Smoke
(Emissions expressed in grams per horsepower-hour)																		
National																		
HDT (I)[a]		40		16	15/20/50[d]	1.5	25		10	15/20/50[d]	1.5	25	10	15/20/50[d]	1.5	25	10	15/20/50[d]
HDT (II)[b]						1.0	25		9.5	15/20/50[d]								
HDT (III)[c]							25		5.0	15/20/50[d]		25	5.0	15/20/50[d]		25	5.0	15/20/50[d]
Heavy duty trucks	HC	CO	NOx	HC+NOx	Smoke	HC	CO	NOx	HC+NOx	Smoke	HC	CO	HC+NOx	Smoke	HC	CO	HC+NOx	Smoke
California																		
HDT (I)	1.0	25	7.5		15/20/50[d]	1.5	25	7.5		15/20/50[d]	1.0	25	6	15/20/50[d]	1.0	25	6	15/20/50[d]
HDT (II) (Optional)[e]		25		5.0	15/20/50[d]		25		5	15/20/50[d]		25	5	15/20/50[d]		25	5	15/20/50[d]
Motorcyles	HC	CO				HC	CO				HC	CO			HC	CO		
(Emissions expressed in g/km)																		
National and California																		
0 - 170cc	5g	17				5	17				5g	12g			5g	12g		
170 - 750	5-14[f]	17				5-14[f]	17				5g	12g			5g	12g		
750+	14	17				14	17				5g	12g			5g	12g		

[a] New test procedures and instrumentation.
[b] Existing test procedures and instrumentation due to insufficient lead time. Small volume (less than 2000) manufacturers may continue to use options of their choice.
[c] More stringent levels which may be enacted by those states which apply to EPA and receive approval.
[d] Diesel only; lugging/acceleration/peak.
[e] Option available for combined HC+NOx standard of 5 gram/brake horsepower/hr 1980 and beyond California HD standards may be enacted by those states which apply to EPA and receive approval.
[f] Linear relationship expressed by the equation: 5.0 + .0155 (D-170). D = size in cc.

The amendments define heavy-duty vehicles as those over 6,000 pounds. Therefore, these more stringent statutory standards also apply to the EPA light-duty truck class which is currently defined as trucks up to 8500 pounds. The amendments also require that test procedures for measuring evaporative emissions from heavy-duty trucks be developed by EPA for the earliest feasible model year.

The amendments also deal with particulate emissions by requiring that particulate regulations based upon best available technology be implemented effective with the 1981 model year. Regulations will be promulgated during 1978 so that manufacturers will have sufficient lead time to comply with the standard.

In addition to the standard setting requirements, the amendments require various studies and reports:

1. Continuing pollutant studies are required by EPA concerning the effects of each pollutant emitted from heavy-duty vehicles and other mobile sources, beginning in June, 1978, and each three-year period thereafter.

2. Particulate studies are also called for. Within 18 months of enactment, a report to Congress is due on health effects of particulates, including an assessment of the technology for controlling such particulate matter. The amendments also require a characterization study of mobile source particulates, including an analysis of relationship to fuel and fuel additives and consideration of particulates unrelated to engine emission (tire debris, asbestos from brake lining, and others).

3. The amendments require a continuing contractual arrangement with the National Academy of Sciences (NAS) to study the technological feasibility of emission control.

4. In order to continue to examine NO_x emissions and their control, EPA is required by the amendments to study the public health needs for development of a 0.4 g/m standard for NO_x and the cost and technological capabilities of attaining such a standard. Congress also established as a research objective the development of automotive technologies which would achieve 90 percent reductions in the NO_x levels from MY 1971 vehicles (i.e., 0.4 g/m NO_x). To achieve this, the Administrator is to promulgate regulations requiring manufacturers to submit low NO_x research vehicles to EPA beginning with the 1979 model year.

5. The amendments also address the associated problems of fuel economy and require that EPA submit a report to Congress detailing the relationship between fuel economy and the emission standard compliance of vehicles of the immediately preceding year.

6. EPA is required to study the feasibility and desirability of on-board hydrocarbon control technology for vapor control at refueling as opposed to on-site gasoline vapor recovery systems. Regulations for onboard hydrocarbon control are to be promulgated, after consultation with the Department of Transportation (DOT), if technology is proven to be feasible and desirable.

7. A study and report to Congress shall be prepared by January 1, 1979, on the effects on public health and welfare of odors or odorous emissions, the source of such emissions, and the available technology and associated costs for the control of such emissions. A study and report of CO intrusion into sustained use vehicles will be prepared including an analysis of the source and levels of CO in the passenger area, the effects of CO upon the passenger, and the available technologies for monitoring.

8. A study and report on the emissions of sulfur bearing compounds from motor vehicles and aircraft will be prepared by August, 1978, and will include public health effects and costs and benefits of alternatives to reduce such emissions.

9. A study and report of emissions of air pollutants from locomotives and locomotive engines will be prepared, including the effect of such emissions upon air quality within air quality control regions, the available technology to control these emissions, and the status of proposed state and local regulations affecting such emissions.

Finally, the amendments specifically provide that EPA, prior to issuing a certificate of conformity, ensure that no harmful pollutants are emitted. Although manufacturers have long been required by EPA regulation to ensure that emission control systems would not result in hazardous conditions, EPA may now require manufacturers to conduct specific testing and analyses to ensure that harmful levels of unregulated pollutants are not being emitted and that no unreasonable safety risk is caused by the emission control system.

Certification Testing

Certification of new passenger cars for compliance with Federal emission standards began with 1968 model year vehicles. The program includes testing of prototype vehicles that represent all new major vehicles sold in the United States.

The manufacturer is required by EPA to submit data from two types of tests which evaluate vehicle conformance to Federal emission standards. First, through the Durability Fleet Test, fleets are tested at 5000 mile intervals up to 50,000 miles to determine the deterioration of the emission control system. Second, through the Emissions Fleet Test, prototype fleets are tested at 4000 miles to determine their emissions at close to the "break in" point. To check manufacturers' data, EPA requires that a vehicle being tested by the manufacturer for durability be brought periodically to the EPA laboratory in Ann Arbor, Michigan, for confirmatory tests. All emission data vehicles are tested in the EPA laboratory.

During the past year, certification of most 1978 model year light-duty vehicles, light-duty trucks, and heavy-duty engines was completed and certification of 1979 models began. The certification program for the 1978 model year involved monitoring the test program of approximately 50 manufacturers, reviewing durability data from approximately 500 vehicles and engines, and reviewing emission data from almost 1000 vehicles and engines. To reach this level of certification, EPA conducted approximately 2200 emission tests on 1978 light-duty vehicles and light-duty trucks.

In addition to the requirements for certification of motor vehicles and engines prior to mass production, EPA has regulations governing changes to vehicles and engines during production. Approximately 1500 running change applications were processed during the past calendar year to determine emission compliance of modified versions of certified vehicles.

Since the 1971 model year, emission test results have been published in the Federal Register. Beginning with the 1973 model year, fuel consumption during the emission test has also been determined and published in the Federal Register. Beginning with the 1974 model year, a "Gas Mileage Guide" listing the comparative fuel economy of all new model vehicles has been prepared by EPA and distributed by the Federal Energy Administration (FEA - now the Department of Energy) for consumer use. During 1977, EPA tested about 900 vehicles to determine their fuel economy rates. Three figures were obtained for each vehicle: a cold-start city mileage figure, a highway mileage figure, and a combined city-highway mileage figure. EPA thus provides emission test results and a broad picture of fuel economy test results for consumers who are concerned with both air quality and fuel economy.

Fuel economy over the last several model years has increased significantly. The estimated average fuel economy of all cars in the 1974 model year was 13.9 miles per gallon (mpg). In 1975, the average increased to 15.6 mpg. In 1976 it was 17.6 mpg and in 1977 it was 18.6 mpg. In 1978 cars are expected to average 19.4 mpg. The 1978 estimate represents a 40 percent increase over 1974 models. The increase is due primarily to shifts to lighter weight vehicles and, to a lesser degree, to changes in engine calibration made possible by the use of catalytic emission controls.

MOTOR VEHICLE EMISSION REGULATIONS -- ACTIONS TAKEN IN 1977

Light-Duty Vehicles and Light-Duty Trucks: Emission Control Regulations

Currently, to determine compliance with emission standards in certifying new vehicles for sale, EPA tests vehicles with their various adjustable parameters (e.g., air/fuel mixture, ignition timing) set to manufacturer's specifications. However, data indicate that significant numbers of these vehicles are exceeding the standards in actual use due to maladjustments.*

On October 21, 1977, a rulemaking was proposed to amend the procedures by which light-duty vehicles (LDVs) and light-duty trucks (LDTs) are tested for the purposes of determining compliance with applicable Federal regulations established under the Clean Air Act. Specifically, this action would permit EPA to test these vehicles with their engines adjusted to any setting within the physically adjustable range, rather than set precisely to the manufacturer's specifications. The goal of this amendment is to require these vehicles to meet the standards even when maladjusted or, more realistically, to motivate manufacturers to effectively reduce the feasibility of maladjustment.

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*Copies of this study, "Automobile Exhaust Emission Surveillance Analysis of the FY 1974 Program-EPA-460/3-76-019," 460-76-019 (September 1976) may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

Inspection/maintenance programs are being established in many states as a transportation control measure to comply with ambient air quality standards. Section 207(b) of the Clean Air Act provides for manufacturer payment of repair for failed vehicles if the vehicle was properly maintained and used and if it was tested by a test which correlates with the Federal Test Procedure used in certification and assembly line testing.

To implement Section 207(b), a Notice of Proposed Rulemaking was published in May, 1977, to establish short test methods and procedures for ascertaining whether a vehicle complies with the emission standard which can be correlated with the Federal Test Procedure. Public hearings were held on the proposal in New York, Chicago, and Portland in September, 1977.

Heavy-Duty Engines: Emission Control Regulations

In September, 1977, EPA promulgated regulations prescribing more stringent gaseous emission standards for heavy-duty gasoline and diesel engines for the 1979 and later model years. The promulgated standards are listed in Table VII-2. Optional use of the existing test procedures and instrumentation will be allowed for 1979 only, due to insufficient lead time for procurement of the improved instrumentation.

Stricter emission standards for heavy-duty vehicles were necessitated by the inability of some air quality control regions (AQCRs) to meet national ambient air quality standards without further control of HC, CO, and NO_x. Although the heavy-duty vehicle population accounts for only approximately five percent of all registered motor vehicles (21 percent of total vehicle miles travelled in 1975), the levels of HC, CO, and NO_x that it is responsible for is significant.

This action is forecast to result in urban air quality improvements of two to five percent for oxidants, one percent for CO, and one to two percent for NO_x.

Motorcycle Emissions

Motorcycles are one of many small but significant sources of emissions. The average uncontrolled motorcycle presently emits about twice as much CO and about six times as much HC as permitted by 1977 automobile standards.

A final rulemaking was published in January, 1977, adopting standards as outlined in Table VII-2. No standards for oxides of nitrogen have been promulgated because an air quality analysis indicates that the motorcycle contribution to motor vehicle NO_x emissions is negligible, estimated to be less than one half of one percent in 1990.

The 1978 standard will result in an average 34 percent reduction in HC and an average 36 percent reduction in CO emissions compared to the uncontrolled motorcycles. For the 1980 standards these percent reductions are 54 and 49 respectively.

Fuel Economy Regulations

During 1977 EPA promulgated several regulations affecting the ongoing fuel economy program. The rules for the testing and calculation of passenger automobile manufacturer's average fuel economy, which was originally published in 1976 as a combined Notice of Proposed Rulemaking and Interim Final Rulemaking, were published as final on September 12, 1977. These rules set forth the procedures to be used to calculate the corporate average fuel economy of passenger auto manufacturers for compliance with the 1978 fuel economy standards.

Similarly, on September 13, 1977, Interim Final Regulations were published establishing procedures for calculating a manufacturer's average fuel economy for non-passenger automobiles (light trucks and vans) effective in 1979 and later model years.

Some minor changes were made by EPA in the fuel economy labeling program to make the information which appears on the fuel economy labels more useful to the consumer. Regulations were promulgated as final on September 12, 1977, affecting the way some cars are classified for fuel economy ranking purposes. For example, the regulations provide for division of the subcompact class into two smaller classes to distinguish the extremely small subcompacts from the subcompacts which approach the compacts in size. This rulemaking also eliminated the practice of specific labeling, which gives the fuel economy of individual vehicle configuration (i.e., specific axle ratio, inertia weight) as opposed to general labeling which gives the fuel economy of a model type. EPA considers that specific labeling practices may represent consumer deception and foster reduced consumer confidence in the fuel economy labeling program.

Another regulation promulgated as an interim rule in July, 1977, established a new set of requirements for the format and content of the fuel economy labels for the 1978 and later model years. This action is intended to improve the impact of the labels by highlighting the pertinent information on the label and directing the consumer to the EPA/FEA Gas Mileage Guide for details. A single format for labeling will be used in 1979 and subsequent model year automobiles.

EPA also published Interim Final Regulations in August, 1977, for retrofit device testing. These regulations establish evaluation criteria and test procedures for evaluating the fuel economy improvement claims and effects on emissions for devices that may be retrofitted on new or in-use vehicles.

Finally, in December, 1977, a Notice of Proposed Rulemaking was published to establish a valid and standardized methodology for calculation of cargo volume, an element used in determination of vehicle class.

EMISSIONS FROM VEHICLES IN USE

Emission Factor and Restorative Maintenance Programs

EPA began an Emission Factor Program in 1971 to determine the emission performance levels of in-use vehicles at varying mileage and age intervals after such vehicles are subjected to actual owner use and maintenance. The collected emission data are critical to various air quality models used by Federal, state, and local agencies to predict ambient air quality. Each year emission data are gathered from a random sample of approximately 2000 in-use vehicles in approximately 6 U.S. cities. The vehicles are all tested in an as-received condition, i.e., as maintained by their owners upon delivery for testing.

The study completed in 1976 (termed the FY 74 Emission Factor Program) tested vehicles in Chicago, Houston, Los Angeles, St. Louis, Washington, D.C., Denver, and Phoenix. It was also the first monitoring of in-use 1975 model year cars, of which 70 percent utilized catalyst technology to control emissions. Of the 1975 model year vehicles tested in the 5 low altitude, non-California cities, 70 percent passed the 1975 HC standard, 51 percent passed the CO standard, 79 percent passed the NO_x standard, and only 37 percent passed all three standards.

This pattern of failure of relatively new cars to meet the standards for which they had been certified made necessary a major effort to pinpoint the cause of these failures. For that purpose, EPA initiated an effort known as the Restorative Maintenance Evaluation Project. This project, initiated in the fall of 1976 and completed during 1977, was designed to test 100 randomly-selected vehicles of MY 75/76 in each of four metropolitan areas (Washington, D.C., Chicago, Detroit, and San Francisco), following a four-step procedure with each car proceeding to the next step only if it still failed to meet emission standards. The procedural steps were as follows: (1) an initial emission test of the vehicles in an as-received condition, (2) a test after correction of any obvious and visible signs of disablement of emission controls which may be detected, (3) a test after carburetor check and adjustment if necessary, and (4) a final test after extensive diagnostics, tune-up, and repair, as necessary. The purpose was to yield data on whether cars will continue to meet emission standards after certification, if properly maintained.

Testing was recently completed on all non-California vehicles. The results in percent of vehicles failing to meet standards and mean emissions from all vehicles are presented in Table VII-3.

Table VII-3. MEAN EMISSION (G/MI) AND PERCENTAGE OF VEHICLES FAILING TO MEET STANDARDS, BY TEST POINT AND POLLUTANT

	Test 1	Test 2	Test 3	Test 4
HC	28.0% 1.32 g/mi	25.0% 1.25 g/mi	7.3% 0.90 g/mi	4.3% 0.89 g/mi
CO	38.7% 20.27 g/mi	35.3% 18.44 g/mi	8.3% 8.13 g/mi	5.0% 7.65 g/mi
NO_x	28.0% 2.82 g/mi	20.3% 2.65 g/mi	17.0% 2.69 g/mi	12.3% 2.55 g/mi
HC or CO	40.0%	36.7%	11.3%	7.0%
Any of HC/CO/NO_x	57.7%	51.0%	27.0%	18.7%
Fuel Economy (mpg city)	13.74	13.75	13.98	13.95

Even though approximately 58 percent of all vehicles tested failed to meet all three emission standards in their as-received condition, the mean emission for all vehicles for HC and NO_x was below the standard. Significant reductions in CO and minor reductions in NO_x occurred as the test series progressed. The mean emission for CO dropped well below the standard when idle mixture settings were restored to specification between tests 2 and 3. These tests confirm the earlier suspicion that idle mixture maladjustments are largely responsible for failure for HC and CO, as shown by the large drop in mean emissions and in percentage failing between tests 2 and 3. Finally, the slight improvement in fuel economy over the four-test series suggests that improved emission performance does not harm fuel economy performance.

ASSESSMENT OF MOBILE SOURCE TECHNOLOGY

Motor Vehicles - Current Technology and Future Trends

Most cars to date have been equipped with a type of emission control device known as an oxidation catalyst. This device is designed to achieve more complete oxidation of hydrocarbons and carbon monoxide into water and carbon dioxide, respectively. In addition, the employment of oxidation catalysts allows the carburetor and distributor to be recalibrated for more optimal fuel economy.

More recently, three-way catalyst systems, first introduced by Volvo in 1976, have begun to appear on certified vehicles in growing quantities and appear to be the systems that are being considered most seriously for future applications. The three-way catalyst has been specifically formulated for control of HC, CO and NO_x simultaneously in one catalyst bed. It provides excellent fuel economy performance with low sulfuric acid emissions.

Turbocharging has also been used on a number of recently certified vehicles. Basically, this technique employs a turbine in the exhaust flow to drive a compressor regulating the intake charge to the cylinders. This results in combustion of more air fuel charge in a given amount of time, thus generating more power. Turbocharging does not appear to have either a positive or a negative impact on emissions at this point, although more data on vehicles targeted to meet future, more stringent standards are needed.

The use of diesel engines in passenger automobiles continues to increase as a result of intensive ongoing research by manufacturers. General Motors has introduced a diesel for the 1978 model year in some passenger vehicles and light-duty trucks. This currently developed engine meets .9 g/m HC, 3.4 g/m CO, and 2.0 g/m NO_x emission levels.

Other engine designs under study include: Rotary, Stirling, Gas Turbine, Variable Displacement, Staged Combustion 3-Valve Prechamber and Direct Injection Stratified Charged Engines. Alternative fuels such as hydrogen and methanol continue to receive active attention.

Improved warm-up emission control devices and heat conservation techniques are two additional areas of emission control development. Warm-up emission control is an important area of concern because a disproportionate amount of HC and CO is emitted during a cold start. Improvements are being made presently in start-up fuel metering and in the use of start catalysts. Heat conservation techniques include port liners, low conductivity coatings, and thermal reactors. Their primary benefit is that they help maintain higher exhaust gas temperatures in the exhaust systems to promote more rapid light-off of catalysts or reactors and additional oxidation of HC and CO during warmed-up catalyst or reactor operation.

The general area of improved fuel metering has been one that has always received great interest and emphasis. Precise control of such parameters as degree of atomization, air/fuel ratio over the range of engine speeds and cylinder to cylinder distribution of fuel can greatly impact pollutant emissions, fuel economy and driveability. Presently, the bulk of the fuel metering system development appears to be concentrated on systems with feedback control of air/fuel metering using an exhaust gas oxygen sensor. The proper exhaust gas oxygen level is necessary for systems that use three-way catalysts. The emphasis on the part of domestic manufacturers seems to be on feedback carburetion as opposed to feedback fuel injection systems.

Another area of accelerated research has been the development of all-electronic control systems for future automobiles. Some components that can be classified as electronic are already being used on vehicles today. Ignition systems, the Electronic Fuel injection (EFI) system, and General Motors' programmed air injection are a few examples. All-electronic control or integration of virtually all variable engine parameters could be expected to permit significant improvement in emission reductions, fuel economy and performance over current, mechanically controlled systems. These control units could also be used to generate quick and accurate data when hooked up to diagnostic instruments, with potential benefits to the public in terms of maintenance quality and costs. Major unsolved problems include the development of inexpensive, precise sensors and activators that will withstand the hostile automotive environment and the development of an appropriate failure mode which would activate an associated interim operational mode.

Finally, Nissan Corporation has demonstrated that further advances in the control of the basic engine emissions are still possible. By employing a twin spark plug cylinder head they have achieved low mileage NO_x results below the 0.4 NO_x level, without catalytic control of NO_x. Whether such results will hold for all classes of vehicles remains to be seen, but it seems to be a potentially promising technique.

Characterization of Currently Unregulated Emissions

Oxidation and three-way catalyst systems have the potential of producing many unregulated pollutants, especially under malfunction conditions such as misfire or rich operation. Such unregulated catalytic pollutants as platinum, nickel compounds, benzene, nitrogen compounds (ammonia, hydrogen cyanide, etc.), sulfur compounds including sulfuric acid, and polyaromatics were first emphasized as potential problems in 1972 and continue to be studied in 1977.

A new study was initiated this year to characterize regulated and unregulated emissions from low NO_x catalysts under malfunctioning conditions. This study extends previous work in this area to include testing of three-way catalyst vehicles and, to a limited degree, dual catalyst vehicles. Studies undertaken in 1976 to study HCN emissions from three way and dual catalysts continue on a low priority basis as work in 1977 has confirmed that HCN emissions are, in effect, no problem, although continued measurement is recommended.

Since the discovery in 1972 of sulfuric acid as an exhaust pollutant from certain prototype catalyst-equipped cars, EPA and others have extensively investigated these emissions. Work during the past year confirmed earlier studies showing that exhaust oxygen levels are the most important single parameter affecting sulfuric acid emissions. However, low exhaust oxygen levels, such as those found with three-way catalyst vehicles or with oxidation catalyst vehicles without air pumps, result in negligible sulfuric acid emission levels -- levels which are equivalent to those found in non-catalyst cars. In addition, limited test results have shown that higher mileage oxidation catalyst/air pump vehicles have lower sulfuric acid emission levels than the same vehicles have at lower mileages. Ongoing studies of vehicle sulfuric acid emission rates, ambient exposures produced by those emissions and possible adverse health effects of sulfuric acid at various levels are expected to provide the necessary data to determine the need for a motor vehicle sulfuric acid emission standard.

In addition to unregulated pollutants from catalyst vehicles, particulate emissions from light- and heavy-duty diesels are being investigated. The vast majority of these particles consists of elemental carbon and large quantities of adsorbed materials including organic compounds, polynuclear aromatics (PNAs) and sulfates. These particulates are less than one micron in size, which allows deep penetration into the respiratory tract with possible deleterious health effects. Characterization studies of diesel engine exhaust particulates initiated in 1976 are continuing in 1977 so that appropriate standards can be proposed. A light- and heavy-duty truck standard for particulates is required for the 1981 model year.

In addition to particulates, diesels also produce crankcase emissions which are currently being characterized. Earlier work indicated that nitrosamines might be present at extremely low levels as engine blow-by emissions. Many nitrosamine compounds, such as DMN, are considered to be carcinogenic.

Various fuel and lubricant additives can have deleterious effects on emission control systems, especially catalytic systems. Studies on a variety of additives (e.g., manganese octane improver additive, barium smoke suppressant, molybdenum sulfide oil additive) continue in an effort to determine their effects on emission control systems. For example, previous studies of manganese octane improver additive (MMT) indicated impairment of emission control system performance and durability at the standard level of 0.125 grams per gallon. The Clean Air Act Amendments have, in response to these studies, severely limited the use of MMT as of November, 1977, and have prohibited its use after September, 1978. If it is found, however, that certain percentages of MMT will not cause or contribute to a failure of any emission control system or device, then a waiver may be granted by EPA. Major test programs are currently being conducted to evaluate identical emission control systems with and without MMT.

Aircraft

Studies are continuing on the emissions of CO, HC, NO_x, and smoke from commercial and private aircraft. Current efforts are concentrated in the following areas:

1. Improvement of the precision of the emission sampling and measurement techniques specified in the EPA regulations;

2. Assessment of progress by private industry and other government agencies in development of techniques for reducing emissions from turbine-powered aircraft; and

3. Development of a new regulation to amend the emission standards for turbine aircraft engines originally promulgated in July, 1973.

In conducting the above programs, maximum advantage is taken of ongoing efforts by other Federal agencies active in the aircraft emission area. These are principally the National Aeronautics and Space Administration, the United States Air Force, and the Federal Aviation Administration (FAA).

In particular, the FAA is continuing their High Altitude Pollution Program (HAPP) to investigate the unique emission effects which high-flying aircraft may have when operating in the stratosphere. EPA is participating in an advisory role in this work and will assess from the experimental findings whether aircraft regulations already promulgated require modification to respond to upper atmosphere problems.

VIII. RESEARCH IN MONITORING INSTRUMENTATION AND QUALITY ASSURANCE

Measurement systems to quantitatively detect pollutants in emissions from sources and in the atmosphere are critical to EPA's abatement and control programs. Initially, methods are needed to determine the extent and causes of a pollution problem and to investigate the health and welfare effects of the pollutants. When regulations, standards, and implementation plans are promulgated, reliable reference measurement methods must also be promulgated to accurately monitor the achievement and maintenance of the standards. The quality assurance program must ensure that the monitoring data EPA uses are sufficiently accurate, precise, and reliable to meet Agency needs at reasonable cost.

MONITORING DEVELOPMENTS

Stationary Source Emissions Measurement

A major effort during 1977 resulted in the revision of Reference Methods 1-8 pertaining to Standards of Performance for New Stationary Sources. The development of methods and instruments for precise and rapid identification and measurement of pollutants from stationary source emissions included many additional accomplishments in 1977. A tentative method for measuring emissions of polychlorinated biphenyls (PCBs) was developed and is undergoing testing. Instrumentation was developed and performance specifications were prepared for hydrogen sulfide monitoring systems. An improved remote optical sensing system, with a newly installed Fourier transform spectrometer, capable of measuring gaseous fluoride emissions was developed.

A transmissometer system was developed that measures the opacity of source emissions containing condensed water; this can provide continuous monitoring of emissions from sources with wet scrubber control systems. A mass emission rate monitor for sulfur dioxide for concentrations in excess of 150 ppm was developed. Techniques were developed for measuring sulfur species in emissions from combustion sources to include (a) sulfates by modification of EPA Reference Method 6, (b) gas phase sulfuric acid by controlled condensation and by dewpoint monitoring system, and (c) sulfuric acid on collected particulate by a microdiffusion technique.

Table VIII-1 (Stationary Source Measurement Methods) lists the methods for which testing was completed in FY 77 and those which were still being evaluated at the end of the year.

Mobile Source Emissions Measurement

Mobile source emissions research resulted in the development of a reference procedure capable of measuring individual hydrocarbons in diesel-powered vehicle emissions. These procedures include all hydrocarbon emissions whether they be gaseous, liquid or bound to particles and will be used to evaluate candidate certification procedures for passenger cars. Two new improved procedures to measure hydrogen cyanide were developed: one procedure provides for real-time analysis while the other technique distinguishes gaseous cyanide compounds.

Table VIII-1. STATIONARY SOURCE MEASUREMENT METHODS

Methods Tested in FY 77		In Process	
Source	Pollutant (EPA Method Number)	Source	Pollutant (EPA Method Number)
Petroleum Refineries	H_2S (11 modified)	Vinyl Chloride Production & PVC Fabricating Plants	Vinyl Chloride (106) (to be collaboratively tested)
Phosphate Fertilizer Plants	Fluorides (13)	Sewage Sludge Incinerators	Mercury (105)
Aluminum Reduction Plants	Fluorides (13)	Battery Manufacturing Plants	Lead
Various Sources	PCBs	Copper Smelters	Arsenic
		Sulfuric Acid Plants	SO_2/SO_3-H_2SO_4 Mist (8 revised)
		Various Sources	Benzene
		Sinter Plants	Condensable organic emissions

Ambient Air Measurement

The decision to make lead a criteria pollutant required that a new reference method be developed for measuring airborne lead. A tentative reference method (using atomic-absorption spectrometry to analyze the lead contained in particulate matter collected over a 24-hour period) was developed.

A method for measuring ambient levels of PCBs was developed. The method is not yet standardized but is being evaluated.

Efforts were made to replace the current calibration procedure for measuring ozone. It is expected that a method involving either improved ultraviolet spectrometry or gas phase titration will be selected in 1978.

New developments to measure ambient air pollutants included an optimum method for measuring atmospheric concentrations of asbestos. A provisional methodology based on collection on nucleopore filters and electron microscope analysis is now available. A method of time integrated collection and analysis of atmospheric ammonia was developed; concentrations as low as 1 ppb can be assayed. A new virtual impactor design will improve the performance and fabrication costs of the dichotomous sampler used to sample particulate matter by segregating the particles into two size ranges -- respirable and non-respirable.

Other developments in 1977 include the application of a proton elastic scattering technique for analyzing light elements (lithium through silicon) in atmospheric aerosols; a technique to estimate the submicron size distribution of atmospheric aerosols; and a prototype photometer for laboratory use in calibrating ozone generators, to serve as EPA's primary reference instrument. A gas chromatograph has been coupled to an optical-acoustic detector and successfully used to measure specific trace gases (e.g., Freon 11 and 12) in the atmosphere; this system has the potential for detecting a large number of gases and vapors.

Table VIII-2 (Ambient Air Quality Measurement Methods) lists the methods tested in FY 77 and those still being evaluated at year's end.

QUALITY ASSURANCE

A five-year quality assurance plan was published in July, 1977. The planning document described the program, summarized the current status of EPA's quality assurance efforts and delineated the resources and approaches required to develop and carry out an adequate Agencywide program to ensure scientifically valid environmental measurements.

Table VIII - 2
AMBIENT AIR QUALITY MEASUREMENT METHODS

Tested in FY-77		In Process	
Pollutant	Method	Pollutant	Method
NO_3	Colorimetric	Oxidant	Chemiluminescent
		SO_4	Colorimetric (automated)
		SO_4	Turbidometric
		Lead	Atomic Absorption (tentative reference method)
		PCB	Gas Chromatographic

FEDERAL REFERENCE AND EQUIVALENT METHODS

A new Federal reference method for NO_2, operating on the principle of chemiluminescence, was promulgated in the December 1, 1976, Federal Register. A short-term continuous NO_2 standard measurement method was also developed.

Improvements in the SO_2 pararosaniline method were also developed.

Measurement methods (for ambient air) that have been approved as reference or equivalent are listed in Table VIII-3.

Table VIII-3. LIST OF REFERENCE AND EQUIVALENT METHODS ESTABLISHED OR REVISED IN FY 1977

DESIGNATION NUMBER	IDENTIFICATION	REF. OR EQUIV.	FED. REGISTER		NOTICE
			VOL.	PAGE	DATE
EQSA-1275-005	Lear Siegler Model SM1000 SO_2 Ambient Monitor	Equiv.	41 42	3893 13044	1/27/76 3/08/77
EQSA-0276-009	Thermo Electron Model 43 Pulsed Fluorescent SO_2 Analyzer	Equiv.	41 42	8531 20490	2/27/76 4/20/77
EQSA-0676-010	Philips PW9755 SO_2 Analyzer	Equiv.	41 42	26252 28571	6/25/76 6/03/77
EQSA-0876-011	Philips PW9700 SO_2 Analyzer	Equiv.	41	34105	8/12/76
EQSA-0876-013	Monitor Labs Model 8450 Sulfur Monitor	Equiv.	41	36245	8/27/76
EQSA-0877-024	ASARCO Model 500 Sulfur Dioxide Monitor	Equiv.	42	44264	9/02/77
OA-1076-014 OA-1076-015 OA-1076-016	MEC Model 1100-1, 1100-2, or 1100-3 Ozone Meter	Ref.	41 42	466747 30235	10/22/76 6/13/77
OA-1176-017	Monitor Labs Model 8410E Ozone Analyzer	Ref.	41	53684	12/08/76

Table VIII-3 (continued). LIST OF REFERENCE AND EQUIVALENT METHODS ESTABLISHED OR REVISED IN FY 1977

DESIGNATION NUMBER	IDENTIFICATION	REF. OR EQUIV.	FED.	REGISTER	NOTICE
			VOL.	PAGE	DATE
EQOA-0577-019	Dasibi Model 1003-AH Ozone Analyzer	Equiv.	42	28571	6/3/77
RFOA-0577-020	Beckman Model 950A Ozone Analyzer	Ref.	42	28571	6/3/77
EQOA-0777-023	Philips PW9771 0_3 Analyzer	Equiv.	42	38931	8/1/77
RFCA-0876-012	Beckman Model 866 Ambient CO Monitoring System	Ref.	41	36245	8/27/76
RFCA-0177-018	LIRA Model 202S Carbon Monoxide Analyzer System	Ref.	42	5748	1/31/77
RFNA-0677-021	Monitor Labs Model 8440E Nitrogen Oxides Analyzer	Ref.	42	37434	7/21/77
RFNA-0777-022	Bendix Model 8101-C Oxides of Nitrogen Analyzer	Ref.	42	37435	7/21/77

IX. ENFORCEMENT

STATIONARY SOURCE ENFORCEMENT

Section 110 -- State Implementation Plans (SIPs)

The highest priority task of the EPA Stationary Source Enforcement Program is attainment and maintenance of the National Ambient Air Quality Standards (NAAQS) for particulate matter (TSP), sulfur oxides (SO_x), and photochemical oxidants (O_x). Under Section 110 of the Clean Air Act, states were required to develop implementation plans for achieving the ambient standards for these pollutants. The date by which these standards were to be met was May, 1975, for all but the 16 states which were granted extensions until May, 1977.

The responsibility for ensuring that stationary sources comply with SIP emission limitations so that target levels of air quality are met is shared by the states and EPA. The states have primary responsibility for achieving clean air within their jurisdictions; however, the Act requires that EPA take independent action when states fail to do so. EPA contributes to state air enforcement efforts through state control agency grants and contractual assistance. Direct enforcement by EPA is also necessary to assist states with source compliance where the state is unable or unwilling to take the appropriate action to assure compliance.

SIP Compliance Status

It is estimated that over 200,000 stationary sources are now subject to SIP emission limitations. Approximately 23,000 of these are "major" sources (i.e., facilities individually capable of emitting more than 100 tons of a pollutant per year). Because these major sources account for about 85 percent of all air pollution from stationary sources, enforcement efforts have centered on bringing these polluters into compliance to achieve the greatest emission reductions possible.

As of October, 1977, EPA and the states had identified 23,033 major sources subject to SIP emission limitations. Of these sources, 21,634 were operating in final compliance and another 1,225 were meeting incremental clean-up dates in compliance schedules or orders, representing a compliance level of 94 percent (Table IX-1).

EPA conducted 2,369 plant inspections and 662 formal enforcement actions while the states were responsible for 25,960 field inspections and initiated 15,646 enforcement actions. These actions were instrumental in bringing many of these sources into compliance. Figures IX-1, IX-2, IX-3 and IX-4 give a breakdown of these figures by EPA regions.

The Task Ahead

The number of sources complying with SIP standards has shown a steady improvement over the last year. However, EPA still has a difficult task ahead as 1,225 major sources remain in violation of emission standards or compliance schedules and the compliance status of 174 major sources is still in doubt. Unfortunately most of these 1,399 sources are located in areas which are not meeting National Ambient Air Quality Standards. To make EPA's and the states' task even more difficult, these offenders are often large sources such as power plants and steel mills which have a history of reluctance to comply with the standards.

In the past, enforcement efforts have mainly concentrated on achieving standards for particulates and SO_2. It is now apparent that considerable effort will also be needed to reduce levels of photochemical oxidants as most AQCRs are not attaining ambient standards for this pollutant. Toward this end, an increased focus will be on reducing levels of hydrocarbon emissions through vigorous enforcement of existing emission standards and assisting in the development of enforceable emission limits in those non-attaining AQCRs where regulations are lacking.

An essential part of EPA's enforcement program deals with assuring continued compliance by sources already meeting the SIP standards. A large number of surveillance investigations must be conducted by EPA and

Table IX-1. COMPLIANCE STATUS OF MAJOR EMITTERS (BY EPA REGION)

(Oct 1977)

EPA Region	Total Class A Sources Identified	Compliance Status		
		Sources Complying With Standards Or Schedules	Sources Violating Standards or Schedules	Sources of Unknown Compliance Status
I	1209	1171	28	10
II	1975	1764	155	56
III	2657	2451	202	4
IV	4762	4542	194	26
V	4404	4046	355	1
VI	2584	2443	90	51
VII	1802	1691	92	19
VIII	650	618	26	6
IX	2153	2093	59	1
X	839	815	24	0
Total	23033	21634	1225	174

Figure IX-1. ENFORCEMENT ACTIONS INITIATED BY EPA REGIONAL OFFICES

October 1, 1976 - September 30, 1977

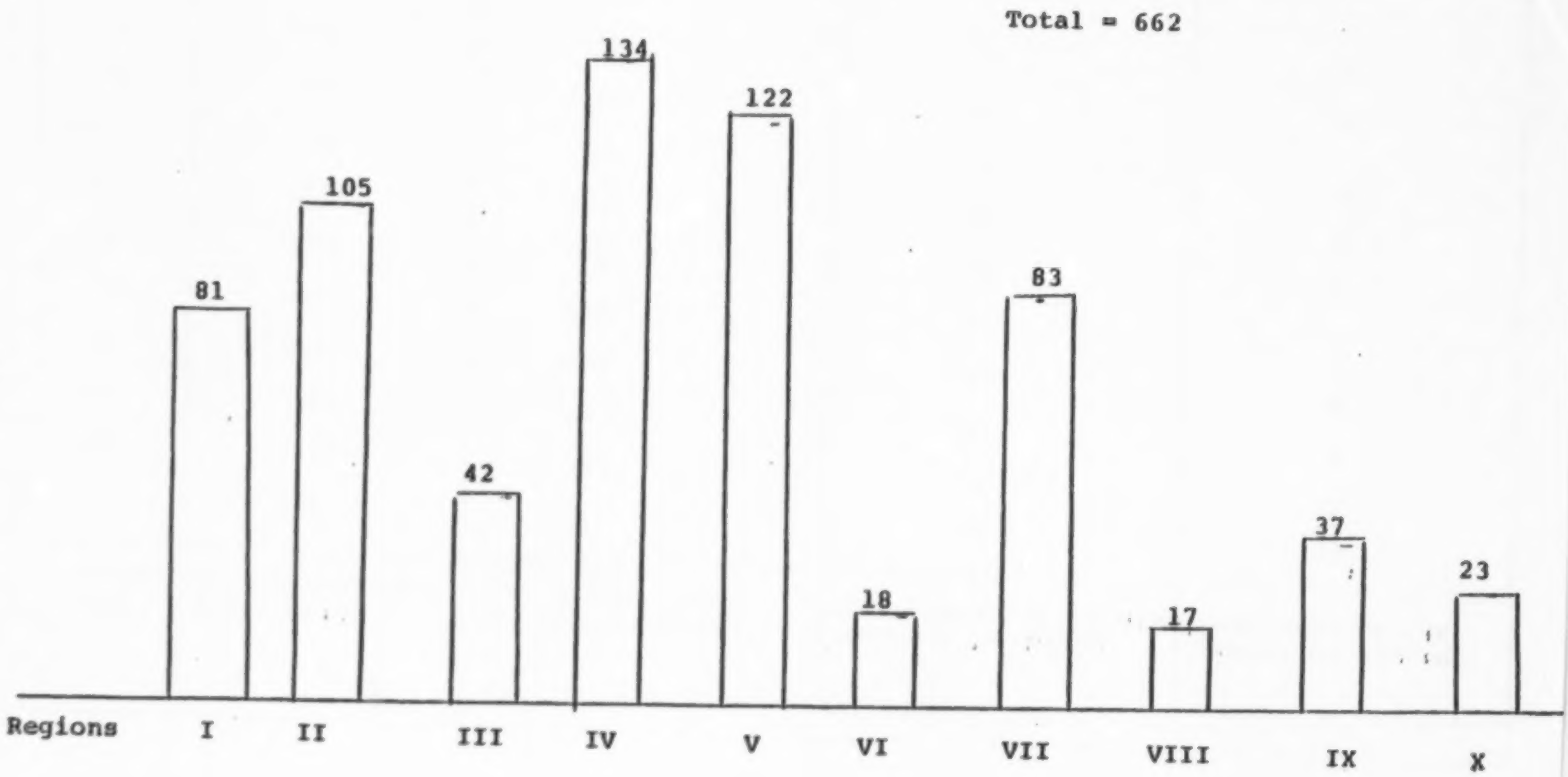


Figure IX-2 ENFORCEMENT ACTIONS INITIATED BY STATES

(by EPA Region)

October 1, 1976 - September 30, 1977

Total = 15,646

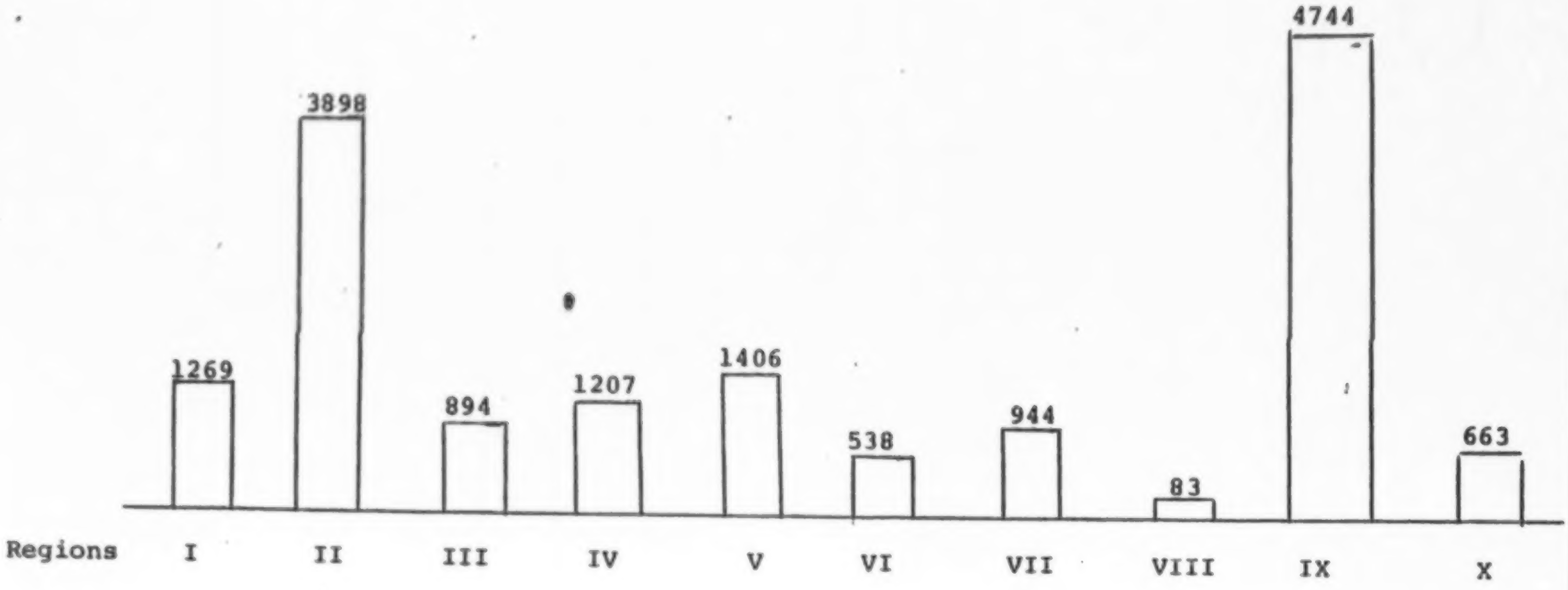
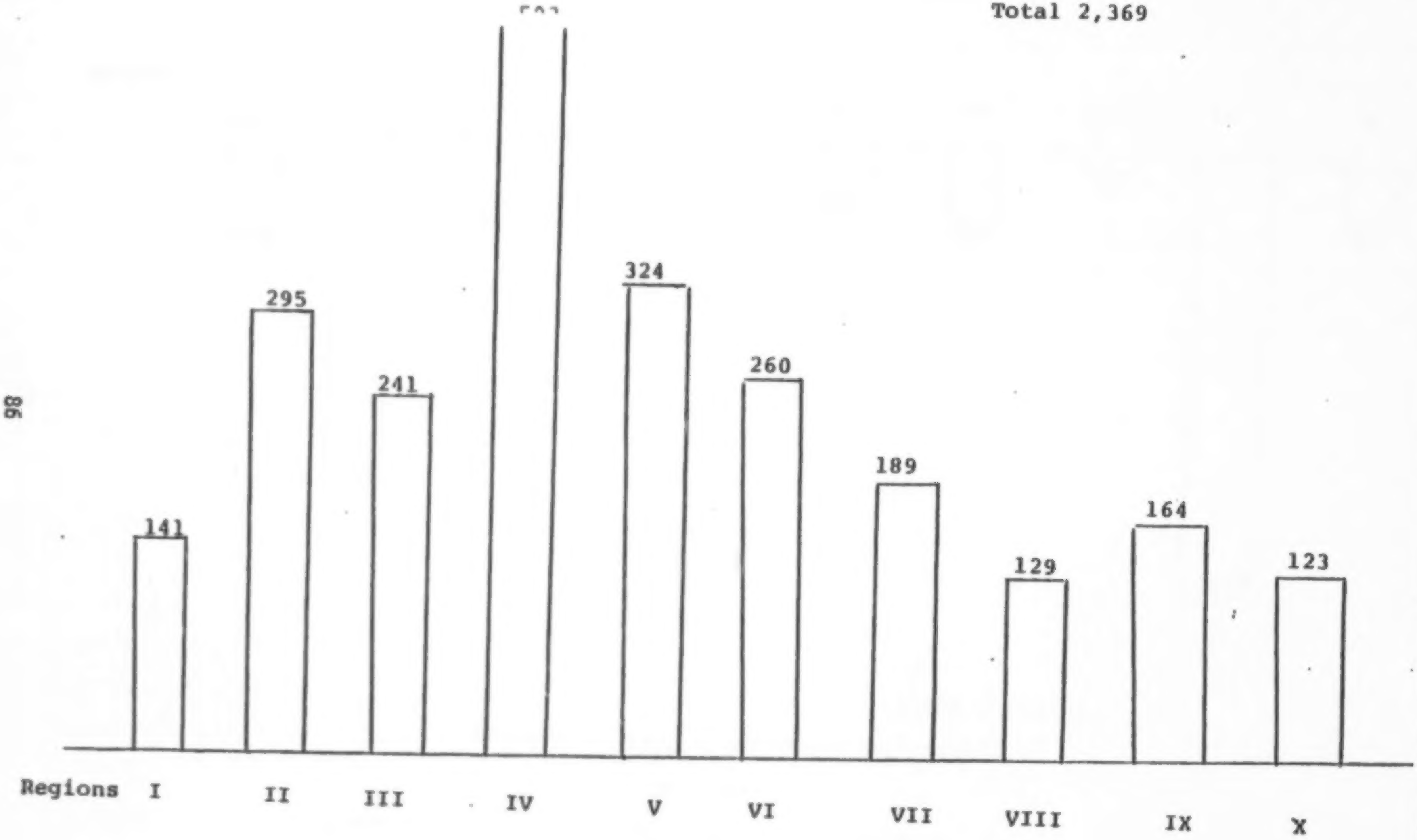


Figure IX-3. INSPECTIONS CONDUCTED BY EPA REGIONAL OFFICES

October 1, 1976 - September 30, 1977

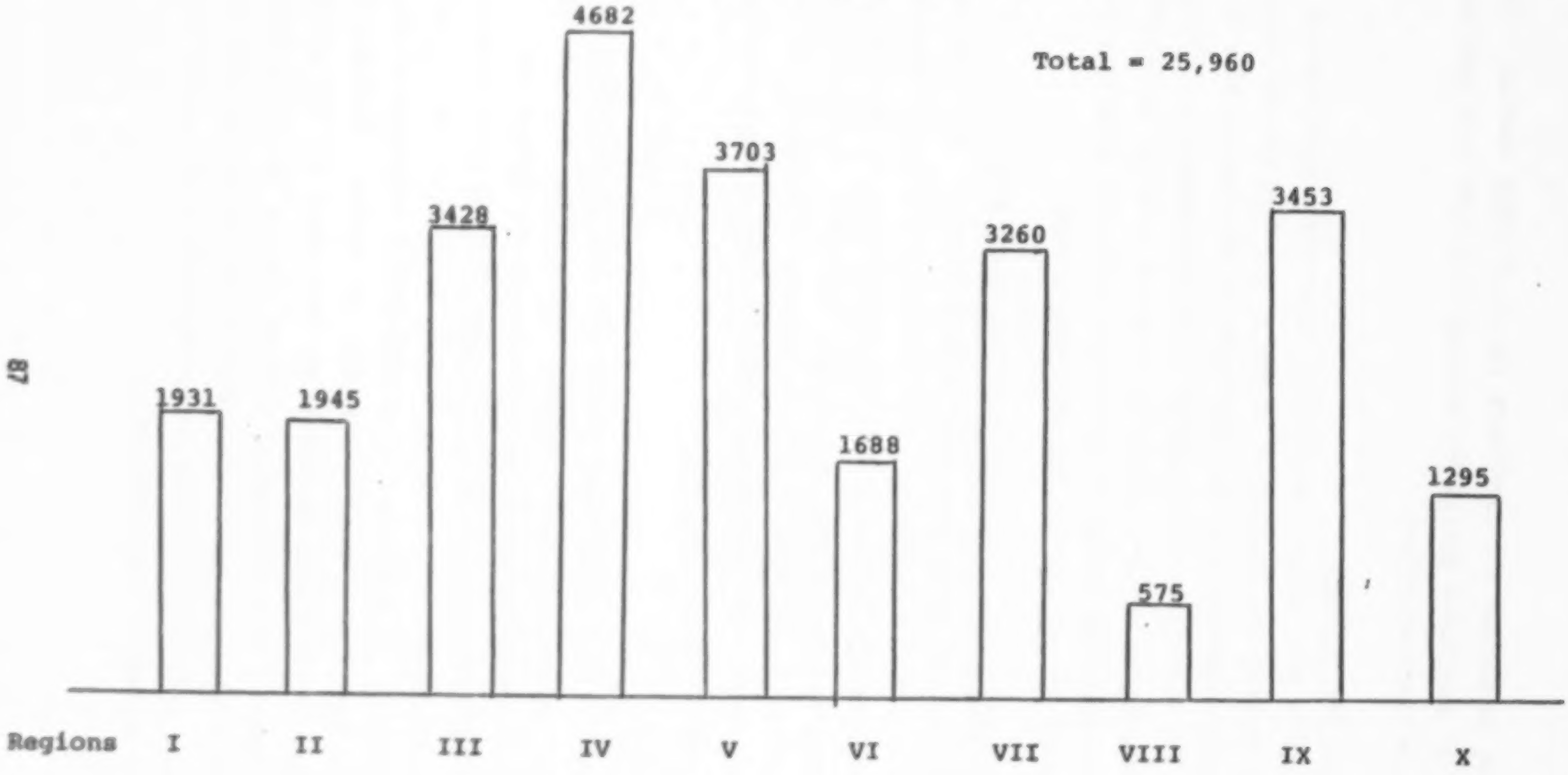


Total 2,369

Figure IX-4. STATE CONDUCTED INSPECTIONS

(by EPA Region)

October 1, 1976 - September 30, 1977



the states to monitor the compliance status of these sources. The incorporation of continuous monitoring programs into SIPs will substantially aid this enforcement effort.

New Source Review (NSR)

All SIPs must contain regulations requiring preconstruction review of proposed sources and disapproval of new or modified air pollution sources which would interfere with the attainment or maintenance of a National Ambient Air Quality Standard (NAAQS). EPA enforcement activities concerning New Source Review include assessing state NSR programs to determine their adequacy, assisting states in instituting effective programs, and initiating enforcement actions against non-complying sources.

Problem Major Source Categories Regulated Under §110

EPA and the states have identified several categories of major sources which lag behind in achieving compliance with emission standards. Among these sources are coal and oil fired power plants, integrated iron and steel manufacturing plants, and primary smelters. Control of sulfur oxide and particulate emissions from these sources is essential if the NAAQS are to be attained. For this reason, EPA has taken special efforts to bring about compliance by these sources.

Power Plants

Coal and oil fired power plants emit nearly two-thirds of the total national emissions of sulfur oxides. In addition, they are responsible for heavy concentrations of particulates in the ambient air.

Of the nation's 623 large coal and oil fired power plants, approximately 71 percent are operating in full compliance with SO_x emission limitations. An additional 16 percent are in violation of the standards and the remaining 13 percent are under EPA review. Included in the latter category are 69 plants in Indiana and Ohio where SIP SO_x standards have only recently been promulgated (Indiana) or are being challenged (Ohio). The 76 enforcement actions initiated by EPA during the past year, as well as state enforcement efforts, were responsible for improved compliance status by many of these sources.

The major approaches to reducing SO_2 emissions from power plants have been the use of low-sulfur fuel or flue gas desulfurization (FGD) systems. At this time, 125 FGD units have been installed, are under construction, or are in various stages of planning. Advances in technology associated with these systems have resulted in the development of new regenerable systems that reduce the waste disposal burden and are capable of achieving 90 percent or better efficiency.

During the upcoming year, state and Federal enforcement agencies will be faced with the difficult task of maintaining SO_x standards in the midst of increasing numbers of Department of Energy (DOE)-ordered coal conversions. Activities will include monitoring compliance of these sources, setting and enforcing interim emission limitations, and coordinating with DOE to identify potential coal conversion sources.

In addition to violating SO_x standards, power plants are also heavy contributors to particulate loadings in the ambient air. At this time, the compliance level for particulate matter is worse than that for SO_x, with only 62 percent of the 623 large plants in final compliance. Particulate control is readily available and of relatively little expense when compared to SO_x control; therefore, compliance status with the standards is expected to improve in the near future.

Primary Non-Ferrous Smelters

Though small in number, the nation's 27 primary copper, lead, and zinc smelters account for about 10 percent of the total sulfur oxides emitted by stationary sources and are at least partially responsible for exceeding NAAQS in many areas.

Five primary smelters are now operating in full compliance with SIP SO_x standards or compliance schedules. Three sources are operating in violation of standards, schedules, or orders. There are 16 smelters located in areas where there is no applicable SIP in effect or where the SIP is inadequate and SO_x standards are needed. EPA and state enforcement efforts will continue to be directed towards developing adequate SIP standards in several states and pursuing actions against violators.

The Clean Air Act Amendments of 1977 provide for issuance of orders specifying final compliance dates for smelters. It is expected that the majority of sources will apply for such orders during the next year. Enforcement agency resources will be required to evaluate requests for these orders and monitor compliance with the terms of the orders.

Iron and Steel Mills/Coke Plants

There are 53 integrated iron and steel plants which produce, in the aggregate, about 90 percent of total U.S. raw steel production. These plants consist of 591 sources of air pollution including coke plants, sinter plants, blast furnace shops, and steelmaking shops (open hearth, electric arc, or basic oxygen furnace). Approximately 15 percent of these sources are operating in final compliance and 26 percent are on strict schedules leading to compliance in the near future. Ten percent (10%) are of unknown compliance status.

Although 49 percent of all integrated steel processes are in violation of applicable standards, considerable progress is being made to bring about compliance by this industry. During the past year, 43 enforcement actions were initiated by EPA. These actions included civil/criminal actions, notices of violation, and administrative orders. It should be noted that the compliance levels quoted above refer to fugitive as well as stack emissions.

Impact of Fugitive Emissions

Fugitive process emissions are pollutants formed during an industrial process which escape to the air without being vented to a stack. Generally, these emissions are difficult to capture and therefore difficult to control.

The steel industry argues that the cost of controlling fugitive process emissions is excessive and that the impact of fugitive emissions on air quality is negligible. However, a number of studies have been conducted which show that fugitive emissions from iron and steel plants are large in terms of mass and have a major impact on ambient air quality.

Despite the reluctance of the steel industry to control fugitive emissions, there have been some improvements in this area. As an example, seven plants have installed equipment for controlling emissions from charging and tapping operations at basic oxygen furnaces during the past year. Prior to this time, there were no controls for emissions from this source in the U.S. Further increases in the number of coke batteries controlling emissions from pushing operations and advances in the control of coke quenching processes have also boosted the control system program for this industry.

Section 111 -- New Source Performance Standards (NSPS)

There are currently 646 new sources in 19 source categories subject to NSPS. Of these, approximately 82 percent are operating in full compliance with applicable regulations. Standards have also been proposed for regulations for another six categories and are expected to be promulgated within the next year. A requirement of the Clean Air Act Amendments of 1977 is the evaluation by EPA of existing NSPS and designation of additional categories of sources emitting pollutants which adversely affect public health or welfare. As more NSPS are promulgated and as older manufacturing plants are replaced by new, more efficient plants, NSPS will play a greater role in achieving and maintaining NAAQS.

Delegation of enforcement authority to state and local governments is crucial to this program. Progress in this area has increased the number of delegations from 20 states and 18 localities in September, 1976, to 34 states and 27 localities by November, 1977. (Table IX-2)

Section 112 -- National Emission Standards for Hazardous Air Pollutants (NESHAPS)

As of October, 1977, 1162 air pollution sources were subject to the NESHAP standards regulating emissions of asbestos, beryllium, mercury, and vinyl chloride. Of these, approximately 95 percent were operating in full compliance with the standards.

On October 21, 1976, vinyl chloride standards were promulgated which applied to 59 existing sources and all new sources. A major effort was required by EPA to inspect these sources and evaluate the large number of applications for compliance waivers. To date, nearly all sources have been inspected and about 50 compliance waivers issued. Sources operating under waivers must be monitored by EPA to ensure timely installation of control equipment and compliance with interim emission limitations. All sources with compliance waivers must be in final compliance by October 21, 1978.

As the scope of the NESHAPs regulations widens, EPA is strongly urging state and local agencies to request enforcement authority. In the past

Table IX-2. DELEGATION OF NESHAP AND NSPS AUTHORITY TO STATE AND LOCAL GOVERNMENTS (November 22, 1977)

EPA	Number of Delegations NESHAPs		Number of Delegations NSPS	
Region	States	Localities	States	Localities
I	5	0	4	0
II	4	0	4	0
III	3	1	2	1
IV	5	2	5	2
V	4	0	5	0
VI	0	0	0	0
VII	0	0	2	0
VIII	3	0	6	0
IX	2	22	3	24
X	2	0	3	0
Totals	28	25	34	27

year, authority was delegated to 13 state and 22 local governments which brought the total to 28 states and 25 localities (Table IX-2). EPA is actively sponsoring programs designed to assist states in requesting and obtaining delegation of NESHAPs authority.

Energy

The Energy Supply and Environmental Coordination Act (ESECA) of 1974 provides a mechanism to require the use of coal by major fuel consumers in order to conserve oil and natural gas reserves. Under the provisions of the Act, the Department of Energy (DOE) shall prohibit certain power plants and may prohibit other major fuel burning installations from burning natural gas or petroleum products.

In June, 1975, the Federal Energy Administration issued prohibition orders to 32 utilities consisting of 74 generating units. A second round of prohibition orders issued in June, 1977, affects an additional 46 units at 25 power plants and other major fuel burning installations. EPA is required to notify DOE which of these plants can burn coal and comply with applicable standards immediately. For those sources unable to comply immediately, EPA will certify the earliest date by which coal may be burned and applicable standards met. All ESECA notifications and certifications made after passage of the Clean Air Act Amendments of 1977 must have the prior written consent of the Governor of the state in which the source is located.

Under Section 113(d)(5) of the Clean Air Act, as amended in 1977, delayed compliance orders (DCOs) may be issued to certain coal conversion sources that cannot immediately comply with standards and whose emissions will not cause NAAQS to be exceeded. (This provision is in lieu of a similar compliance date extension mechanism contained in Section 119 of the Clean Air Act in effect prior to the 1977 Amendments. It provides for issuance of DCOs in appropriate cases where conversion to coal is required under new or amended energy legislation.)

Section 110(f) of the Act was amended in 1977 to provide a mechanism for temporary suspension of applicable SIP requirements where such action is necessary to respond to a national or regional energy emergency declared by the President. Prior to the 1977 Amendments, the authority for such general suspensions did not exist and enforcement discretion was used in handling most emergency situations. (This provision may be superseded by a provision in the proposed National Energy Act.)

Section 125 was added to the Act by the 1977 Amendments and provides that a major fuel burning stationary source may be prohibited from using fuels other than locally or regionally available coal if it is determined that such action is necessary to prevent or alleviate significant local or regional economic disruption or unemployment which results from the use by that source of petroleum products, natural gas, or coal obtained from another region or locale. (It is expected that this provision will be amended when the proposed National Energy Act becomes law.)

MOBILE SOURCE ENFORCEMENT

The Mobile Source Enforcement program is directed primarily toward achieving compliance with vehicle emission standards, fuel regulations, and mobile source related aspects of state implementation plans promulgated by EPA under the Clean Air Act. The activities of the program include preventing introduction of uncertified new domestic and imported vehicles into commerce; auditing certification procedures of domestic and foreign automobile manufacturers; enforcing vehicle assembly line emission test activity and the recall, warranty, anti-tampering, and imports provisions of the Act; developing and enforcing Federal regulations for the removal of lead from gasoline; and ensuring compliance with transportation control plans, mobile source related vapor recovery regulations, and inspection and maintenance programs.

Inspection/Investigation Program

Section 206(c) of the Clean Air Act authorizes the enforcement activities related to emission requirements for "new" motor vehicles or engines, i.e., motor vehicles or engines which have not yet been sold to the ultimate purchaser. This authority includes right of entry for the purpose of conducting tests of vehicles in the hands of the manufacturer and for inspecting records and facilities used by the manufacturer in complying with the Act. Section 208 of the Act authorizes written inquiries by EPA in order to determine whether a manufacturer is or has been acting in accordance with the Act.

During FY 1977 Mobile Source Enforcement personnel have conducted 85 inspections of domestic and foreign motor vehicle manufacturers. Such inspections include detailed audits of procedures and records and visual inspection of facilities and vehicles in order to determine whether manufacturers are and have been acting in compliance with the Clean Air Act and its regulations.

A total of 11 vehicle manufacturer investigations have been conducted during FY 1977, some of which arose from inspections. These investigations consist of a search of vehicle manufacturer records and documents and interrogation of individuals to determine whether violations of the Clean Air Act and its regulations have occurred. Issuance of requests for production of information pursuant to Section 208 of the Act frequently accompany such requests, including requiring the manufacturer to develop emission test data where violations may be accompanied by effects of emission performance. During FY 1977, 12 Section 208 letters have been issued.

Final action was also taken on two cases which were previously referred to the Department of Justice. The U.S. District Court in Washington, D.C. ruled that EPA did not have the legal authority to bring suit against Chrysler Corporation for introducing into commerce 9,185 vehicles that were materially different from the vehicles Chrysler submitted to EPA for certification testing. The Agency believed the applicable certificate was void ab initio since Chrysler installed a different emission component in a prototype test vehicle than that described to EPA in the Corporation's Application for Certification and actually installed in production vehicles. The Court stated that fraud on the part of the Corporation must first be proven under the existing regulations before certificates can be declared void, and there was no such evidence in this case.

In a second case against Chrysler, the same Court ruled that the Corporation did introduce into commerce certain misbuilt 1974 model year vehicles not covered by certificates of conformity. These vehicles were assembled with incorrect carburetors, distributors, exhaust gas recirculation valves and orifice spark advance control valves at the Hamtramck, Michigan Assembly Plant. Unlike the previous case, in this instance the prototype vehicles were tested with the correct emission parts but production vehicles were assembled with components different from the test vehicle and those described in the Application for Certification. Of significant importance to the Agency was the Court's ruling that, as a matter of law, a vehicle is not covered by a certificate of conformity if it contains parts different from those described in the Application and reasonably expected to affect emissions even though the vehicle may, in fact, meet emission standards.

Recall Program

Section 207(c) of the Clean Air Act authorizes EPA to order recall of vehicles if they do not conform to emission standards. EPA has resolved eight investigations since September 30, 1976, and initiated an additional ten investigations since that date. Thirty vehicle classes are presently under investigation. For the period September, 1976, to September, 1977, manufacturers have initiated recalls on approximately 5.6 million vehicles as a result of EPA investigations. These recalls are being monitored by EPA.

One recall order has been contested to date. Chrysler Corporation requested a hearing to contest the Administrator's December 8, 1976, order which involved approximately 208,000 1975 Chrysler vehicles. The hearing, which under EPA regulations is a formal adjudicatory hearing on the record before an Administrative Law Judge, has recently been completed (November 9, 1977). The major issues in the litigation include the Agency's interpretation of the terms "properly maintained and used" and "substantial number" as they are used in the Act, the type of data which EPA may rely on to support a recall order, general manufacturer liability under the Act for foreseeable in-use conditions, and specific manufacturer liability for acts of its authorized dealerships insofar as emission control related maintenance is concerned. A decision is expected early in 1978. Both parties have appeal rights.

Warranties and Aftermarket Parts Program

The warranty provisions of the Clean Air Act are designed to help assure that manufacturers develop and produce vehicles that meet emission standards throughout their useful lives. There are two separate warranties, one which has been in effect since the 1972 model year (Section 207(a) of the Act), and one which will not be implemented until the Agency publishes regulations doing so (Section 207(b) of the Act, now scheduled for promulgation for the 1979 model year and beyond). In conjunction with these provisions EPA is also developing a program for certification of aftermarket parts (i.e., those produced by business concerns which are independent from the vehicle manufacturers) in order to alleviate potential anticompetitive problems stemming from the presence of warranty coverage for a 5 year/50,000 mile period. Under the Clean Air Act as amended in August, 1977, the program is required to be in effect by August, 1979.

The Section 207(a) or "production" warranty provision requires that manufacturers warrant all regulated vehicles and engines to be designed, built, and equipped to meet emission standards at the time of sale and to be free of defects in material or workmanship which cause the vehicle or engine to fail to conform to standards for a period of 5 years or 50,000 miles, whichever first occurs. The Agency believes that this warranty has proved to be of little utility to date since owners rarely know which components and failure modes are covered by it, and, even when claims are made, owners are often unable to show that their problem is one causing emissions to exceed standards. To overcome these difficulties, the Agency intends ultimately to promulgate regulations defining the coverage of this provision, and has taken the first step in this regard by publishing an Advance Notice of Rulemaking on November 16, 1976. The 1977 Clean Air Act Amendments have strengthened the Section 207(a) warranty by providing that an improper claim dishonor by a manufacturer shall be treated as a prohibited act (Section 203(a)(4)(D)) with a potential $10,000 fine. EPA will be employing this increased authority to assure that owners are treated fairly when bringing emission production warranty claims.

The Section 207(b) or "performance" warranty, when implemented, will require a manufacturer to repair vehicles which, although properly maintained, still fail a state or local emission inspection program employing an EPA-approved short test. Promulgation of this warranty has been delayed to date because of technical difficulty in identifying relatively quick and inexpensive short tests which "are reasonably capable of being correlated" with the sophisticated test used on prototype vehicles, as Section 207(b) requires. However, EPA has now developed tests which it believes may satisfy the requirements of the Act and proposed them on May 25, 1977, along with proposed performance warranty regulations. Due to changes in various aspects of the Section 207(b) warranty coverage made by the 1977 Clean Air Act Amendments, the warranty regulations will be reproposed. However, final promulgation in time for the 1979 model year is still anticipated.

Certification for aftermarket parts has for some time been considered the optimum solution to potential anticompetitive problems raised by the emission warranties. In passing the 1977 Clean Air Act Amendments, Congress settled on this method by directing EPA to establish such a program within the next two years. EPA and the aftermarket industry have anticipated this need and have been involved during the past few years in development of technical criteria and standards by which such emissions certification may be approached. EPA has published an Advance Notice regarding the goals and requirements which such a program might entail.

The program would enable aftermarket manufacturers to qualify their parts for use in maintenance under the emission warranties and thus eliminate any fear on the part of owners that use of aftermarket products would void emission warranty coverage. This will probably require some testing by the aftermarket manufacturers and a willingness to warrant their products in a similar fashion as vehicle manufacturers are required to do.

Selective Enforcement Audit Program

On July 28, 1976, regulations were published establishing a program for testing new production vehicles at the assembly line in order to assure that they comply with emission standards. The program is called Selective Enforcement Auditing (SEA) and involves the testing, pursuant to an administrative order and in accordance with the Federal Test Procedure, of a statistically representative sample of production vehicles from a specified configuration. If nonconformity is established, EPA may suspend or revoke the certificate of conformity.

The program was run on a trial basis until December 31, 1976. Test orders were issued but no enforcement sanctions were to be imposed as the result of vehicles failing to meet emission standards. One trial audit each was run for American Motors, Chrysler, Ford, and General Motors.

Starting January 1, 1977, the SEA regulations became fully effective. Two audit teams have conducted a total of twenty-one audits for model year

1977. One manufacturer failed an audit and, as a result, made an engineering change to bring the vehicles into compliance.

The Clean Air Act Amendments of August, 1977, require EPA to promulgate regulations by August, 1978, for assessing heavy-duty vehicle and engine manufacturers nonconformance penalties for failure to meet the standards. Additionally, EPA must promulgate regulations for testing heavy-duty vehicles and engines at the assembly line to prevent the sale of vehicles and engines which exceed the standards by more than the permissible amount.

Anti-Tampering Program

Section 203(a)(3)(A) prohibits any person from removing or rendering inoperative a vehicle or engine's emission control system prior to sale and delivery to the ultimate purchaser. It also prohibits any manufacturer or dealer from knowingly tampering with such systems after sale and delivery to the ultimate purchaser. Section 203(a)(3)(B) was added in the 1977 Amendments and expands the prohibition after sale and delivery to include persons engaged in the business of repairing, servicing, selling, leasing, or trading motor vehicles or motor vehicle engines, or persons operating fleets of motor vehicles. During 1977, 71 tampering inspections and interviews were conducted. Thirty-four cases were referred to the Department of Justice for litigation. A total of 30 cases are currently under investigation. Civil penalties totalling $8,500 were collected for 5 cases settled during this fiscal year.

Imports Program

Section 203 of the Act gives EPA and the U.S. Customs Service joint responsibility for enforcing the prohibition against importation of nonconforming motor vehicles. Over the past year, EPA has monitored the importation of all motor vehicles entered into the commerce of the United States. Of these, 1400 vehicles were imported under bond pending a demonstration of conformity. Administrative sanctions were imposed against 245 importers for noncompliance with the regulations.

EPA has conducted 40 investigations of alleged illegal importations. Four cases were referred to the Department of Justice for action.

Unleaded Enforcement Program

EPA has responsibility for enforcing Section 211(c)(I) of the Clean Air Act relating to the regulation of fuels and fuel additives. On January 10, 1974, EPA promulgated regulations requiring the general availability of unleaded gasoline by July 1, 1974, for use in 1975 and later model cars equipped with catalytic emission control systems.

EPA has established a nationwide Fuels Enforcement Program for ensuring that affected retail outlets are in compliance with these regulations. This program includes sampling of the fuel at retail outlets by regional EPA field inspectors, private and state inspectors under EPA contract, and the analysis of the samples for lead content.

From October 1, 1976, to September 30, 1977, EPA has conducted approximately 29,847 inspections of service stations to ensure compliance with the unleaded fuel regulations. At the stations, 25,109 gasoline samples were taken, of which about 1.38 percent were found to be contaminated with lead. Enforcement has issued 747 complaints and has collected $226,865 in penalties during this period.

Lead Phasedown Program

On December 6, 1973, EPA issued regulations controlling the amount of lead additives used in gasoline. The original lead reduction schedule limited the average amount of lead in gasoline to a maximum of 1.4 grams per gallon (gpg) in 1976, 1.0 in 1977, 0.8 in 1978, and finally to 0.5 by 1979.

Because of studies indicating that gasoline shortages would result if the original schedule were enforced, EPA amended the regulations in September, 1976. The amended regulations retain the 0.5 gram per gallon standard, but extend the period for compliance with that standard from January 1 to October 1, 1979, in order to allow sufficient time for refiners to install the equipment necessary to meet the reduced lead level without causing a gasoline shortage. The January 1, 1978, standard of 0.8 gram per gallon also remains in effect but will be suspended if a refiner can show that he has taken, and is continuing to take, sufficient actions in procuring and installing equipment to ensure the achievement of the 0.5 gram per gallon standard by October, 1979, or before.

Requests for suspension of the 0.8 gpg lead standard have been received from 58 refiners for 115 refineries. As of December 28, 1977, 47 suspensions have been granted. The Clean Air Act Amendments of 1977 mandate separate treatment for small refineries (50,000 barrels per day or less crude capacity and owned by a refiner with crude capacity of 137,500 barrels per day or less) with regard to lead level requirements.

Stage II Vapor Recovery

Regulations requiring the control of vapors emitted during transfer operations in the gasoline marketing chain have been promulgated under Section 110 of the Clean Air Act. Stage I involves the recovering of vapors emitted during the filling of delivery trucks and the subsequent filling of underground storage tanks. EPA has promulgated Stage I vapor recovery regulations in 13 air quality control regions. From October 1, 1976, to September 30, 1977, EPA has conducted 2,533 inspections of service stations to ensure compliance with the Stage I vapor recovery regulations.

Regulations to control gasoline vapors during vehicle refueling (Stage II vapor recovery regulations) were promulgated in the original State Implementation Plans in late 1973 and early 1974. These regulations specified that 90 percent of gasoline vapors emitted during vehicle refueling must be recovered, but did not include a test procedure for evaluating a system's performance. In October, 1975, revisions were proposed to the regulations. The revisions included establishing a mass emission standard rather than the 90 percent recovery requirement and proposed several test procedures which could be used to certify system performance prior to installation but which, because of complexity, were not useful to monitor performance in the field.

Based on the development of a short test that can be used to test the performance of Stage II equipment in the field, the Stage II vapor recovery regulations were reproposed in November, 1976. The new proposal abandoned the earlier system certification approach and adopted in-use field enforcement as the primary means for assuring compliance with the requirements. The new proposal also allows small marketers more time than the major oil companies to meet regulatory requirements.

Several of the 1977 Clean Air Act Amendments impact upon these regulations. Provisions dealing with onboard hydrocarbon technology, fill-pipe standards, cost of emission control for vapor recovery and applicability of vapor recovery regulations are being evaluated in conjunction with the public comments which have been received since the November, 1976, proposal.

THE LIST OF VIOLATING FACILITIES

The List of Violating Facilities is designed to prevent the Federal Government from subsidizing pollution law violators with contract, grant or loan monies. In 1977 the List began to be integrated into EPA's stationary source enforcement activities. While no additional Clean Air Act violators were listed, in several instances listing investigations led to prompt settlement of cases against major violators who had been out of compliance for several years. In these cases, a consent decree including a mutually acceptable compliance plan was worked out, which resolved the Federal court case and removed the threat of listing. Sources to which this scenario applied in 1977 included Kaiser Steel Corporation, Fontana, California; U.S. Steel South Works, Chicago; and Interlake Steel, Chicago.

Also, in 1977 the Office of Federal Activities (OFA) made use of the regulations whereby Federal agencies must withhold awarding contracts to a facility for up to 15 days if the facility is under consideration for listing.

There were two challenges in 1977 in Federal District Courts to the validity of the Listing regulation with respect to air violators. In both cases EPA prevailed. U.S. vs. U.S. Steel, May 6, 1977 10 ERC 1751 (N.D. Ill. 1977) and U.S. v. Interlake, 432 F. Supp. 987 (N.D. Ill. 1977).

COMPLIANCE BY FEDERAL FACILITIES

It is the policy of the Federal government that Federal agencies shall provide leadership in the prevention, control, and abatement of air pollution through the compliance of their facilities with applicable air quality standards and emission limitations established pursuant to the Clean Air Act.

The 1977 Amendments expanded the responsibilities of the Federal agencies to comply with applicable requirements. In addition to complying with substantive air pollution control standards, Federal facilities must now comply with procedural requirements, including recordkeeping, reporting, etc. The President has also been given the discretionary power to exempt, in the interest of national security, certain kinds of Armed Forces property which are uniquely military in nature.

Compliance Status

As of November 1, 1977, 68 (17 percent) of the 393 major Federal facilities subject to the Clean Air Act were out of compliance with air quality standards or emission limitations because of operational and maintenance problems, construction delays, delays in testing for final compliance, and delays, deferrals, or failures to identify needs relating to budgeting for pollution abatement projects. Of those noncomplying facilities, 45 (66 percent) are on an approved construction schedule; however, 24 (35 percent) of the noncomplying facilities are not currently anticipated to be in compliance by the July 1, 1979, statutory deadline.

X. LITIGATION IN 1977

PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

EPA promulgated regulations for PSD in December, 1974. The PSD regulations are designed to protect air which is cleaner than the minimum ambient standards in many areas of the country. The PSD regulations were challenged in court by many parties, including both industrial and environmental groups. In August, 1976, the U.S. Court of Appeals for the District of Columbia Circuit upheld the PSD regulations against arguments that they were unauthorized and arguments that they were not sufficiently stringent. 1/ The Supreme Court granted petitions for certiorari on April 4, 1977.

Because the 1977 Clean Air Act Amendments contain detailed PSD requirements and specifically provide that EPA's 1974 regulations will remain in effect, EPA asked the Supreme Court to dismiss the cases. On October 3, 1977, the Court granted EPA's request.

TIMELINESS OF CHALLENGES TO EPA REGULATIONS

The courts have continued to rule that Section 307 of the Act bars challenges to the validity of EPA regulations, including its approval of state implementation plans, if such challenges are not filed within the time specified by Section 307. 2/ In a case involving enforcement of certain transportation control measures applicable to New York City, for example, the U.S. Court of Appeals for the Second Circuit held that Section 307 barred belated challenges to EPA's original approval of the measures, and the Supreme Court has declined to review the decision. 3/ In another case, the U.S. Court of Appeals for the Eighth Circuit held that this limitation on review is constitutional in the context of a civil action. 4/ Whether the limitation applies in the context of criminal enforcement actions as well, as held by the U.S. Court of Appeals for the Sixth Circuit, is expected to be decided by the Supreme Court this term. 5/

HAZARDOUS AIR POLLUTANTS

In a 1976 case, the U.S. Court of Appeals for the Sixth Circuit upheld a criminal indictment against a demolition company for violation of the national emission standard for asbestos. 6/ The company had argued that the standard, as applied to demolition operations, specified a "work practice" rule rather than a numerical limitation on emissions and was accordingly beyond EPA's authority to promulgate under Section 112 of the Act. Although the Court of Appeals found that review of the rule was precluded by Section 307 of the Act, it observed that it saw nothing inconsistent with the purposes of the Act in EPA's promulgation of such a rule. The case was appealed to the Supreme Court and is now pending decision. 7/

In the interim, EPA's authority to promulgate "work practice" rules has been made explicit by the 1977 amendments to the Act, and certain amendments to the asbestos standard have been upheld by the U.S. Court of Appeals for the District of Columbia Circuit. 8/

TRANSPORTATION CONTROL MEASURES

EPA has not as yet obtained a final judicial ruling on the legality, under the Clean Air Act and the constitution, of EPA's regulations requiring states to implement measures to reduce pollution from private vehicles using public roads. As noted in the 1976 report, the circuits are split on this subject, with the U.S. Court of Appeals for the Third Circuit upholding EPA's regulations, 9/ the Fourth and Ninth Circuits striking them down or declaring them unenforceable, 10/ and the D.C. Circuit upholding certain regulations but not others. 11/ EPA sought Supreme Court review of the latter three decisions. In May, 1977, the Supreme Court remanded those cases back to the Courts of Appeals for further consideration. 12/ In November, 1977, the Court of Appeals in the District of Columbia remanded the regulations for the National Capitol area to the Agency for reconsideration in the light of the recent Clean Air Act amendments and other developments, 13/ and in December, 1977, the Court of Appeals in California invalidated the regulations for that state as being beyond the Agency's authority under the Clean Air Act. 14/ It is hoped that further Agency and court proceedings will resolve these issues surrounding EPA's authority to require states to establish transportation control programs.

In another 1977 decision, the U.S. Court of Appeals for the Second Circuit held, over statutory and constitutional objections, that a state and its subdivisions can be required to implement transportation control measures in a SIP--at least where the measures had been adopted by the state itself. In a 1976 case described in last year's report, the Second Circuit affirmed the right of citizens to sue a state or local government for compliance with transportation control measures and other SIP requirements. 15/ But the district court held on remand that compelling a state or city to implement transportation control measures by controlling the conduct of others is unauthorized under the Act, and perhaps the constitution. 16/ The Court of Appeals reversed, and the Supreme Court declined to review the Court of Appeals' decision. 17/ EPA supported the position of the citizen group in this litigation.

PRE-ENFORCEMENT REVIEW

In the case of Fry Roofing Co., v. EPA, 18/ the Eighth Circuit, affirming a holding of a U.S. District Court in Missouri, held that the Clean Air Act bars pre-enforcement review of enforcement orders issued under Section 113(a).

TALL STACKS AND SUPPLEMENTARY CONTROL SYSTEMS

Two cases involving the use of dispersion techniques as opposed to constant controls systems are now pending in the Ninth Circuit. In Bunker Hill v. EPA, 19/ the Court held that EPA could only require the use of constant controls to the extent economically and technologically feasible, and has remanded the SIP regulations at issue to the Agency for reconsideration of their feasibility. EPA has petitioned the Court to reconsider its holding in light of the Clean Air Act Amendments of 1977, which make clear that dispersion techniques are not permissible substitutes for constant controls required in SIPs. In Kennecott Copper Corporation v. Costle 20/, on appeal from a ruling of a U.S. District Court in Nevada that constant controls (as opposed to dispersion techniques) could not be required in a SIP if economically infeasible, the Ninth Circuit has requested and the Agency has provided a post-argument brief explaining the impact of the Bunker Hill decision and the 1977 Amendments on the case.

USE OF MODELING IN THE PROMULGATION OF SIPs

As a result of the state's failure to submit a SIP for SO_2, EPA promulgated a SIP for Ohio in August, 1976. In large part, the SIP was based on sophisticated air quality dispersion modeling. Because of the number of sources involved, the modeling was the most extensive used to date. Thirty-five petitions challenging the SIP were filed with the United States Court of Appeals for the Sixth Circuit. 21/

In November, 1976, the Sixth Circuit, while considering motions for a stay pending appeal sua sponte, remanded the regulations to EPA to take additional comments for sixty days. EPA's response to the comments was filed with the court on May 31, 1977. In June, 1977, the court denied motions for a prehearing conference and to consider the need for a further stay and required expeditious briefing and argument of the merits. Oral argument was held on October 21, 1977. The decisions of the Court will not only be important to the Agency's regulatory effort in Ohio, but will also be looked to as a strong indication of the judiciary's willingness to accept modeling as a major regulatory tool.

REFERENCES

1. *Sierra Club v. EPA*, 540 F.2d 1114 (D.C. Cir. 1976).

2. *E.g.*, National Association of Demolition Contractors v. Costle, Nos. 74-1545 *et al*. (D.C. Cir. Oct. 13, 1977); Lloyd A. Fry Roofing Co. v. EPA, 10 ERC 1082, No. 76-1731 (8th Cir. May 11, 1977); Friends of the Earth v. Carey, 552 F.2d 25 (2d Cir. 1977), *cert*. *denied*, No. 76-1718 *et al*. (Oct. 17, 1977); U.S. v. Adamo Wrecking Co., 545 F.2d 1 (6th Cir. 1976), *cert*. *granted*, No. 96-911 (argued Oct. 11, 1977).

3. Friends of the Earth v. Carey, *supra*.

4. Lloyd A. Fry Roofing Co. v. EPA, *supra*.

5. U.S. v. Adamo Wrecking Co., *supra*.

6. U.S. v. Adamo Wrecking Co., *supra*.

7. Adamo Wrecking Co. v. United States, Sup. Ct. No. 76-911, argued October 11, 1977.

8. National Association of Demolition Contractors, Inc. v. Costle, *supra*.

9. Pennsylvania v. EPA, 500 F.2d 246, 256, 261 (3d Cir. 1974).

10. Maryland v. EPA, 530 F.2d 215, 226-27 (4th Cir. 1975), *vacated sub nom*. EPA v. Brown, 97 S.Ct. 1635 (1977); Brown v. EPA, 521 F.2d 827, 831 (9th Cir. 1975), *vacated* 97 S. Ct. 1635 (1977).

11. District of Columbia v. Train, 521 F.2d 971, (D.C. Cir. 1975) *vacated sub nom*. EPA v. Brown, 97 S.Ct. 1635 (1977).

12. EPA v. Brown, 431 U.S. 99 (1977).

13. District of Columbia v. Costle, Nos. 74-1013 *et al*. (D.C. Cir., November 10, 1977).

14. Brown v. EPA, Nos. 73-3306 *et al*. (9th Cir., December 23, 1977).

15. Friends of the Earth v. Carey, 535 F.2d 165 (2d Cir. 1976).

16. Friends of the Earth v. Carey, 442 F.Supp. 638 (S.D.N.Y. 1976).

17. Friends of the Earth v. Carey, 552 F.2d 25 (2d Cir.), *cert*. *denied* 46 U.S.L.W. 3261 (Oct. 17, 1977).

18. 554 F.2d 885 (1977).

19. ___ F.2d ___, 10 ERC 1401 (No. 75-3670).

20. No. 77-1359.

21. Cincinnati Gas & Electric Co. et al., v. EPA, Nos. 79-2090 et seq.